AURORA

FOR THE FIRST TIME, THE BASICS OF PLASTIC MODEL BUILDING...

60¢

THE COMPLETE BOOK OF PLASTIC MODEL KITS

PREPARED BY
THE ADVISORY BOARD OF THE
AURORA PLASTICS CORPORATION

OVER 80 ILLUSTRATIONS

HISTORY IN MINIATURE

Fly the skies over World War I battlefields in your Spad XIII.
Lead a task force to victory on the bridge of the U.S.S. Halford.
Speed ahead of the pack at the Indianapolis "500" in a bullet-nosed Maserati.
You are there, in the thick of battle, at the peak of excitement.

THE COMPLETE BOOK OF PLASTIC MODEL KITS

contains everything you'll want to know. It's a must-have book for hobbyists—filled with how-to facts and tips for assembling and decorating every category of model, with ideas galore for displaying and motorizing your finished models.

It's all here at last in a compact, easy-to-understand manual. You'll find an answer to every question, a use for every type of model. With this book as your guide, you'll discover the thrill of *making* history.

THE COMPLETE BOOK OF PLASTIC MODEL KITS

PREPARED BY
THE ADVISORY BOARD OF THE
AURORA PLASTICS CORPORATION

Published by
DELL PUBLISHING CO., INC.
750 Third Avenue
New York 17, N.Y.

First Dell printing—September, 1961

Printed in U.S.A.

CONTENTS

1

THE WORLD OF PLASTIC SCALE MODELS

Model making—or the building of miniature representations of objects—has been with us since the dawn of time. This fact has been borne out by the archaeologists' excavations which have unearthed examples of craftsmanship ranging from the very crudest to some of the finest works of art our world has known.

As civilization became more sophisticated, model building developed into a highly respected, often thoroughly professional avocation. The early hobbyist had to start from scratch. He had to gather the wood and other necessary equipment used in the construction of a model; he had to create his own plans, develop his own tools.

In the early 1930's, kit models were introduced that provided the hobbyist with plans and balsa wood parts. Still, model building was a complex, exacting task, calling for hours of work on intricate details.

This was true until 1947 when a new type of "solid" scale kit made its appearance on hobby dealers' shelves. These were the complete, all-plastic model kits.

Several years passed before these kits were accepted by the public. It was not until 1954 that they began to achieve the following—now grown to phenomenal proportions—which has made them one of the fastest selling items on dealers' shelves.

The reasons for this popularity are obvious. Plastic models

are designed so that every part can be precision engineered. Each model is a painstakingly faithful reproduction of its prototype, the full-size original. This super-detail and dramatic realism give you a model that you will be proud to display—a project that may be completed in a few hours. Plastic models make attractive mantel, bookshelf, wall, or desk displays, and are so inexpensive—with prices beginning as low as a quarter—that they are within the range of the slimmest budget.

As the popularity of plastic scale kits has increased, so has the range of models available. From the original collection of airplanes, ships, and automobiles, the field has grown to encompass such items as human and dinosaur skeleton kits, racers, motorcycles, animals, jets, tanks, missiles, space stations, firearms, knights in armor, totem poles, warriors, butterflies, submarines, and customized cars.

Manufacturers can make a plastic kit of almost anything. For example, one company, specializing in scientific model kits, has made available an accurate, life-size anatomical model of the human head and neck for educational purposes. Each tooth can be "extracted," and one of the molars comes apart to show its internal composition. The inner ear is a unit in itself, and can be disassembled to reveal the complex internal structure.

In addition to the solid scale kits, there are such plastic action models as motorized model airplanes and automobiles. The fun of building is doubled when power plants are added, transforming the hobbyist into a pilot or a racing driver.

There is no end to the variety of plastic kits; new models are added each season in an exciting stream of authentic reproductions.

The relative popularity of the different types of models can be seen from the following statistics. (These are subject to change, as hobbyists shift their enthusiasms radically from year to year.) Aircraft and jets account for 27 per cent of the kits purchased each year; automobiles, including racers, 29 per cent; ships and boats make up 20 per cent of the market; missiles, rockets, and space vehicles are 9 per cent; military ground force equipment, such as tanks and rocket

launchers, 6 per cent; and miscellaneous types of plastic kits, 9 per cent.

The "Family Opinion Poll," sponsored by the Monsanto Chemical Company, reveals that 90 per cent of the boys between the ages of eight and fifteen build plastic models, as do 26 per cent of the males twenty-one and over. This means that there are more than 26,000,000 plastic model builders in the United States.

Equally impressive is the fact that 54 per cent of all plastic model builders are collectors, and 61 per cent of all collectors assembled twenty or more models during the past three years.

Many hobbyists concentrate their interest in one field, such as aircraft, while others run the gamut of available models in their collections. We have all seen the efforts of model makers displayed in schools, bank windows, historical museums, and industrial exhibitions. Perhaps you have already experienced the sense of accomplishment that comes from "showing" your collection. If not, it is something to look forward to, a goal toward which to build.

A recent survey among hobbyists indicated that collections are usually made of the models with which the builder is most familiar and in which he has the greatest interest. For instance, an ex-fighter pilot may work with models of the planes he flew or with examples of early aircraft; a retired sea captain may assemble ships from his past; a retired railroader may concentrate on transportation models, building military vehicles and antique automobiles. More on the subject of collecting plastic models may be found in Chapter 6.

While plastic model building has replaced stamp collecting as the leading "dollar-volume" hobby in the United States, it has also become extremely popular in such European countries as France, Italy, Great Britain, and West Germany.

By their amazing sales throughout the world, plastic models have proved that they do not put the "do-it-yourself-from-scratch" modeler out of business—instead, their great variety and versatility have not only increased the ranks of the model building public, but have also provided new challenges to the imagination and ingenuity of the builder.

For example, the authenticity of plastic models makes them extremely popular at schools of all kinds. At the U.S.A.F. Air University's Institute of Technology, instructors use plastic models of jets to teach the principles of the wind tunnel. The U.S. Department of Education, in a recent appropriation for the purchase of scientific materials for high schools and colleges, specified plastic models as one of the categories under the National Defense Education Act of 1958.

Plastic models may be used in a wide variety of ways—and may even be combined with other hobby interests. For instance, scale models greatly enhance the realism of a model railway layout and add an extra dimension to the hobby of photography. Chapter 6 deals more fully with these matters.

Certain types of scaled plastic models are made for action. In such models it is sometime necessary to sacrifice a few details, but most "action" models are almost as faithful to the original as "show" scale models. Complete information on this type of model may be found in Chapters 7, 8, and 9.

HOW A PLASTIC MODEL IS BORN

A new kit begins its life at a conference of the manufacturer's executives meeting with the heads of the sales, design, and engineering departments. At such meetings, recent trends and surveys are studied along with dealers' reports. From these three sources, manufacturers decide on the new models that are most likely to appeal to plastic kit enthusiasts across the country. Sketches of proposed models are made, and once a design is decided upon, all its features, including scale and cost, are worked out.

From this high level conference the project is turned over to the engineering department whose task it is to make the plans for the master model. The engineers and draftsmen work from official blueprints, data, and photographs, furnished by the manufacturer of the prototype, to give the model authenticity down to the tiniest detail. It is often necessary to make extensive field trips to measure proto-

types and to make hundreds of photographs and sketches. These trips take model designers far afield: to the Smithsonian Institute in Washington, D. C.; the United States Army Proving Grounds at Aberdeen, Maryland; to museums and factories throughout this country and Europe; to international airports and famous auto racing tracks. The startling realism and precise scaling of plastic kit models are the results of this vast research.

Scale refers to the relation in size between the model and its prototype. It may range from 1:540 (1 foot equals 540 feet) to 1:48. For example, one well known atomic submarine now in service is 400 feet from bow to stern and its model is 2 feet long. In this case, the manufacturer used a 1:200 scale. Most aircraft models use scales measuring 1/4 inch equals 1 foot.

When the new model has been worked out completely on paper, the plans are turned over to the design department where a master model maker creates an exact model by hand in plastic, wood, metal, or plaster. The master model is perfectly finished to tolerances of a few ten-thousandths of an inch and may take several months to complete.

A steel mold is made from the master model which is used to reproduce the plastic parts of the kit. The mold is tooled by a pantograph milling machine, which traces the contour of the master model into steel, and by hobbing, which presses a hardened form into the steel to yield the required contour. The making of steel molds is the most expensive and difficult part of the plastic kit operation since it requires the work of many specialists in intricate metal working. A completed steel mold usually weighs more than half a ton.

When the mold is completed, test runs are made to check the plastic parts for accurate fit. Often it is necessary to check and recheck the model assembly and to make changes and revisions in the mold. The test runs continue until every part fits perfectly with every other part. At this point, the engineering department will prepare the instruction sheet for assembly from the information gathered during the test assemblies.

To make the plastic parts for mass production, the steel

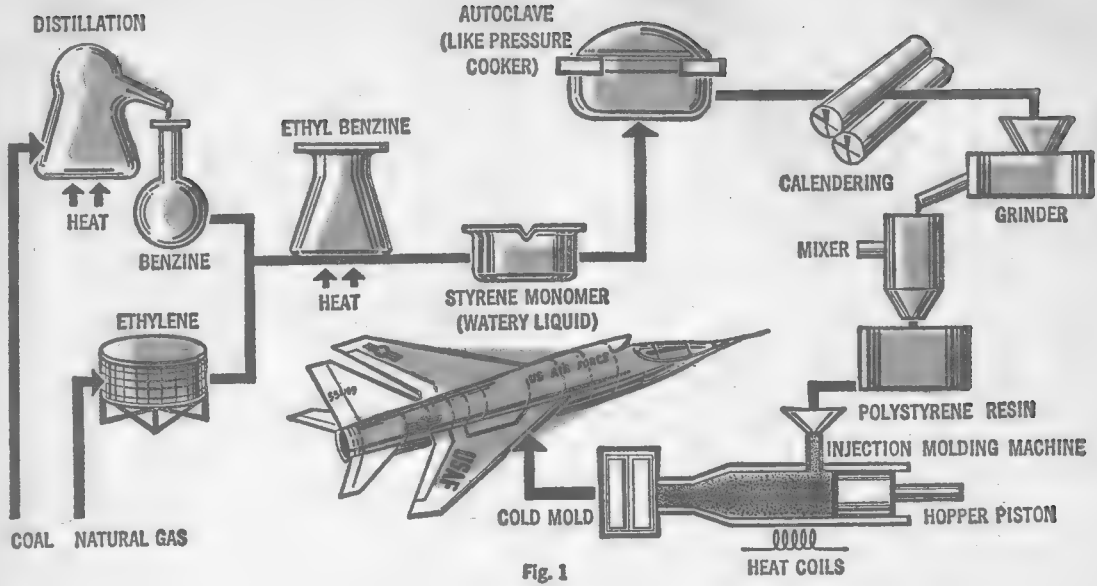

DISTILLATION
HEAT
BENZINE
ETHYLENE
COAL
NATURAL GAS
ETHYL BENZINE
HEAT
AUTOCLAVE
(LIKE PRESSURE
COOKER)
STYRENE MONOMER
(WATERY LIQUID)
CALENDERING
GRINDER
MIXER
POLYSTYRENE RESIN
INJECTION MOLDING MACHINE
COLD MOLD
HOPPER PISTON
HEAT COILS

Fig. 1

mold is placed in an injection molding machine. The majority of kits made today are molded of polystyrene plastic. (Figure 1 shows how the two basic raw materials—natural gas and coal—are chemically combined into plastic, and the process involved in making this plastic into parts for model kits.) When the polystyrene reaches the large injection molding machine, it is in the form of small flakes. It is first brought to a temperature of approximately 500° F., and then injected into the mold at pressures of 15,000 to 20,000 pounds per square inch. At this point, the polystyrene resembles thick molasses. The period of operation for injection, cooling, and ejection of the parts is usually accomplished in less than a minute.

The parts come out of the injection molding machine with "trees" or "runners" attached. Some manufacturers call this excess plastic *gates* in their instruction sheets. The parts are molded to exact shape in silvery aluminum, olive drab, or other basic colors. Since color is a part of the plastic parts, the time the hobbyist needs to spend on decoration has been greatly reduced.

After all the parts are molded, they are packed in boxes containing colorful, authentic decals and a complete assembly instruction sheet. For additional realism, sculptured figures and similar extras are often included in the kits. The boxed sets are now ready for the hobbyist. They depend on his skill and ingenuity to give them life.

2

GETTING READY TO ASSEMBLE PLASTIC MODELS

There are two important rules to remember in assembling plastic models: *Work slowly* and *follow the manufacturer's instructions carefully.*

The following list of items, compiled after a careful study of models and instruction sheets, covers the tools and equipment you will require as you assemble a plastic model.

1. A bottle or tube of polystyrene cement.
2. Several straight pins or toothpicks, used to apply cement to small parts and to make small details with paint.
3. Three clean soft cloths—one used to keep your hands clean of cement; the second used to apply decals and to clean transparent parts; and the third used to apply abrasive paste or polish. (The three cloths should *never* be used interchangeably.)
4. Several razor blades or a sharp knife, used to trim away excess plastic. A hobby knife set may be used for this trimming work.
5. A dish or a small bowl, used to hold water required for mixing abrasive compound paste and for applying decals.
6. A pair of scissors, used to cut out decals.

These are the items essential for the assembly of every plastic kit. Following is a list of additional material which will come in handy with the more complicated models.

7. Several cotton swabs, used to apply cement to large areas.

8. Various sizes of rubber bands, used to hold cemented parts together during the drying period.

9. Several spring clothespins, used as clamps to hold large cemented pieces together while drying. They should be shaped as in Figure 15, page 29.

10. A pair of tweezers, used to hold small parts when applying cement and paint.

11. Pieces of balsa wood or cardboard, used as jigs to hold cemented parts at proper angles.

12. Small amounts of modeling clay, used to balance certain models.

13. A can of household cleanser or silver polish, used to remove scars and polish damaged surfaces.

14. A sheet of very fine sandpaper, used to smooth rough plastic surfaces.

15. An old flat table knife, used to flare the ends of plastic axles.

16. A cement tube holder. See Figure 14, page 29.

17. Special plastic paints and enamels in a variety of colors. See Chapter 5.

18. A bottle of plastic paint thinner, used to thin paints or enamels and to clean brushes after use.

19. A bottle of plastic flat coat, used where a flat finish is desired.

20. A paint mixing tray or palette. A flat pan, made by folding up the edges of a small piece of aluminum foil, is good for this purpose.

21. A small bottle of household alcohol, used to thin flat coat and to clean brushes after use.

22. Several sizes of artists' brushes (from the smallest available to about 1/4 inch wide), used to apply plastic paints and enamels.

23. An airbrush. See Chapter 5.

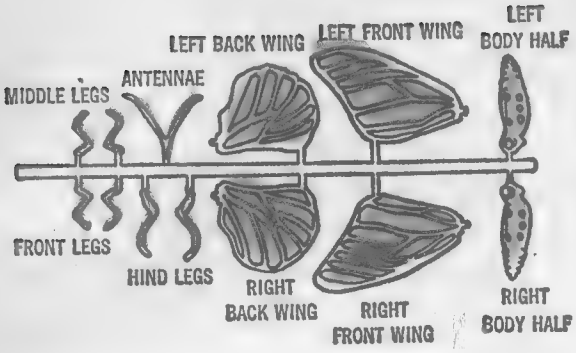
24. A flat ruler or scale, used for making measurements and as a clamping device while cemented parts dry.

25. A small can of clear spar varnish, used to coat decals.

26. Several sizes and colors of thread for various types of rigging. See Chapter 5.

27. A crochet needle or needle threader, used in rigging sailing ship models.

MONARCH



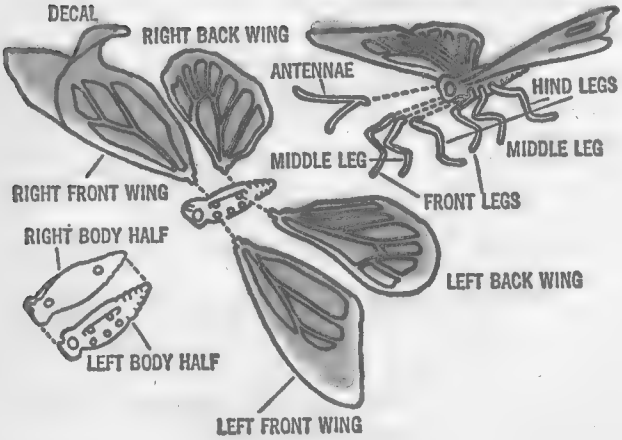


Fig. 2

28. A roll of cellulose or masking tape, used for various clamping operations and for masking when decorating.

This list of items does not include tools required in converting finished models for use (see Chapter 6) or in motorizing models for action (see Chapters 7, 8, and 9).

All items needed to assemble a kit should be gathered before you start and be at hand throughout the assembling and decorating operations. All items on the list will fit neatly in a shoe box when they are not in use.

Select a work area where you will have enough room to spread out the parts of your model and its instruction sheets. When working on a table, cover its top with thick newspaper, wax paper, or oil cloth. Do not work on a varnished, shellacked, or lacquered surface without this protection. Any spilled cement will ruin the table's finish.

HOW TO READ KIT MODEL PLANS

Your kit may contain as many as three hundred parts, as well as instructions and a sheet of decals. Most of the plastic parts will be attached to "trees" or "runners," illustrated in the sketch of the Monarch Butterfly (Figure 2) by light shading.

The parts—the colored part of the top drawing—will be detached from their trees when each is to be assembled. However, bits of the trees are sometimes used as a plastic paste seam filler, described in the next chapter.

Before attempting an assembly, take everything out of the box and spread the parts on your working surface. Check the parts against the instructions to be sure that everything you will need is there. Any part that is damaged or missing may be obtained by writing to the manufacturer.

While all the parts are out before you, it is a good idea to read the manufacturer's instructions and become thoroughly familiar with the various items in the kit. Reread the instructions and try to visualize the assembly procedure. For practice, read the following instructions and try to imagine the assembly of the simple Monarch Butterfly:

1. Cut out sections of decals and apply to wings of butterflies as indicated in drawings. Apply decals according

to directions on back of decal sheet. Allow decals applied to wings to dry for at least 1 hour, then proceed to assemble each butterfly.

2. Cement body halves together.

3. Cement wings to slots in sides of body.

4. Cement pegs on left and right hind legs (long legs) to back holes on sides of body.

5. Cement pegs on left and right front legs and middle legs to holes on sides of body.

6. Cement antennae to body.

7. Allow cemented parts to dry thoroughly. Then, paint body, legs, and antennae as indicated in drawings. Remember: *do not detach or break any parts from their trees or runners until you are ready to assemble that part.*

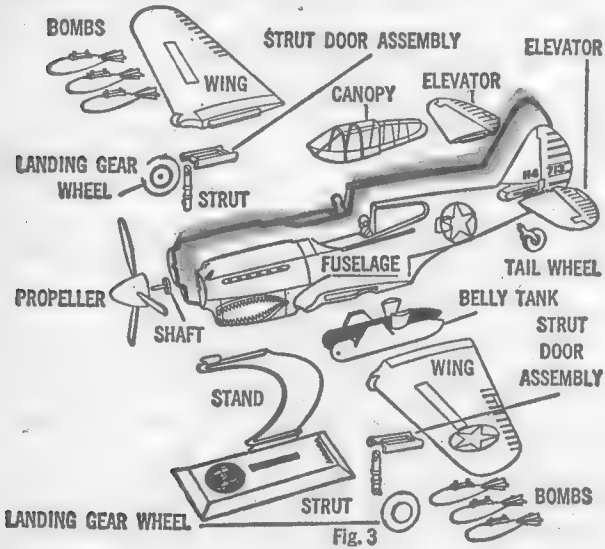


Fig. 3

Manufacturers illustrate their instruction sheets in different ways. The most common and the easiest to read is the exploded working drawing (Figure 3).

Another popular technique employed to illustrate the

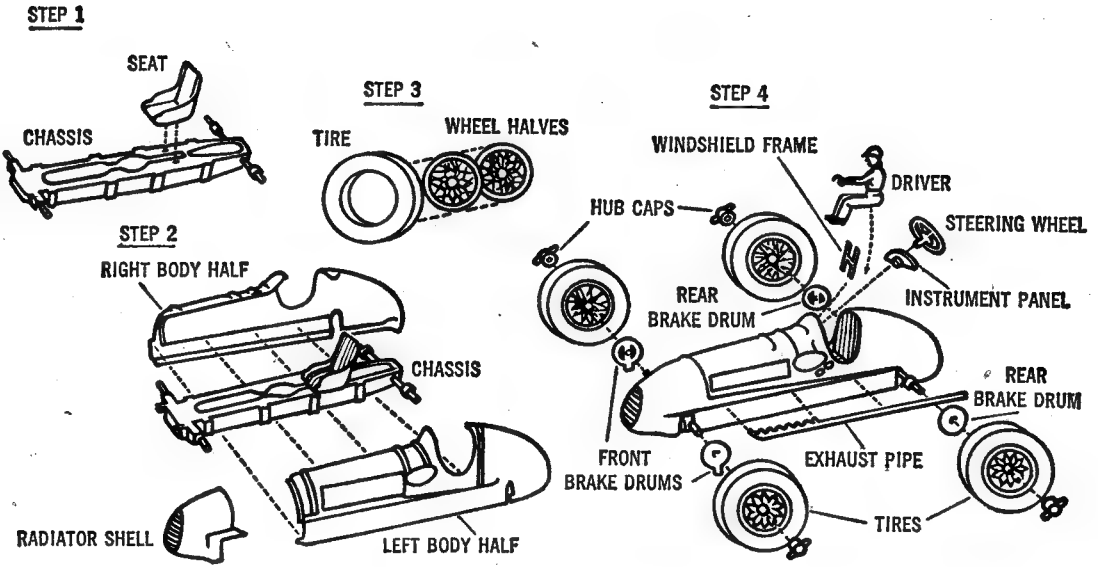

STEP 1
SEAT
CHASSIS
STEP 3
TIRE
WHEEL HALVES
STEP 4
WINDSHIELD FRAME
DRIVER
HUB CAPS
STEERING WHEEL
REAR
BRAKE DRUM
INSTRUMENT PANEL
REAR
BRAKE DRUM
FRONT
BRAKE DRUMS
EXHAUST PIPE
TIRES
STEP 2
RIGHT BODY HALF
CHASSIS
RADIATOR SHELL
LEFT BODY HALF

Fig. 4

assembly procedure is the pictorial step-by-step drawing shown in Figure 4. In some kits, each piece is identified by a number appearing either on the inside of the part or on surplus plastic near the part. In such kits, the numbers indicate the order of assembly (Figure 18, page 33).

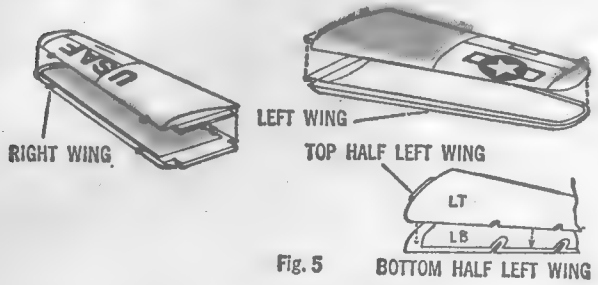


Fig. 5

In other kits you may find a letter code in place of numbers. For example, on airplane wings that are made of two halves, you may find the letters "LT" and "LB" embossed on their inner surfaces, as shown in Figure 5. Such letters indicate that the left top (LT) wing half should be cemented to the left bottom (LB) wing half.

A few kit manufacturers employ small detachable lettered or numbered discs, or engraved bars, on the parts. These can be removed once you have identified the piece with the appropriate assembly or sub-assembly. In some cases only those parts which could lead to confusion are lettered.

The importance of understanding the directions and the working drawings given on the manufacturer's instruction sheet cannot be overemphasized. If you know this information thoroughly and are familiar with all the parts and their functions, you should have no difficulty in assembling any plastic kit model.

3

THE FUN BEGINS

After you have studied the manufacturer's sketches and working drawings, have read the instructions carefully, and are thoroughly familiar with all the parts of the kit, you are ready to proceed with the assembly of the model. Remember to work carefully and patiently; to assemble the model exactly in the order suggested by the kit's instruction sheet.

In this chapter we will look at some general assembly techniques. In the next chapter we will discuss specific models and how they are assembled.

Before you start the assembly operation, spread the instruction sheet so that you can read it easily. If possible, have the sheet at eye level on the wall above your work area so that it is before you at all times. It is a good idea to check off each step with a pencil as it is completed.

To assemble any kit model, carefully detach the parts from their trees or runners as they are needed. A pair of scissors will do the job very neatly. (If you are going to paint details on these small parts, it is wise to do so before they are removed from their trees. See Chapter 5.) Then trim away any excess plastic with a razor blade or a sharp knife (Figure 6). This will allow the pieces to fit together smoothly and to move freely.

After the excess plastic has been trimmed away, you are ready to cement the parts. Before proceeding with this operation, it is advisable to assemble the parts partially without cement to be certain you know how and where they fit. When doing this, note the points where the cement should be applied. Most manufacturers design their parts so that

cement may be applied to underside or inside surfaces to avoid visible cement smears. If a part does not fit perfectly, more trimming may be required. Do not force any parts into place. They will fit perfectly if properly trimmed and positioned.

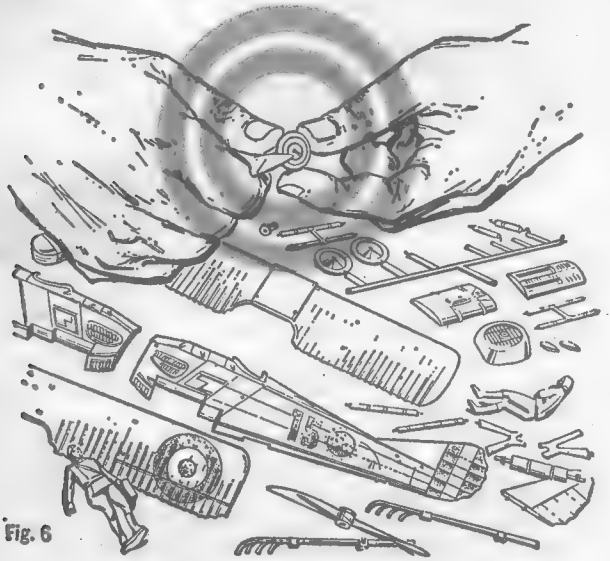


Fig. 6

Since most model kits are molded of polystyrene plastic, be sure to use only a good polystyrene—sometimes called styrene—cement. This type of cement acts as a slight solvent, fusing the surfaces together. Regular balsa model cement, airplane dope, or household cement does not give adequate adhesion and should not be used for plastic models. Polystyrene cement is available in tubes or bottles at most kit dealers.

Apply cement sparingly. If too much is used, it may soften and distort the plastic and damage the details on your model. Bottled cement should be applied with a small brush or with the ready-made cotton swabs which druggists sell. Cement from a tube may be applied directly on the large joints

(Figure 7), and a toothpick or pin may be used for small parts.

Remember that on smaller parts a tiny drop of cement is sufficient. When you are working with small pieces, use a pair of tweezers to hold them while you are cementing.

Apply the cement only to inside surfaces, or to surfaces where parts join. Avoid getting the cement on the exterior of the model sections and on your fingers or hands. The neatness of the finished model is the mark of a professional kit builder.

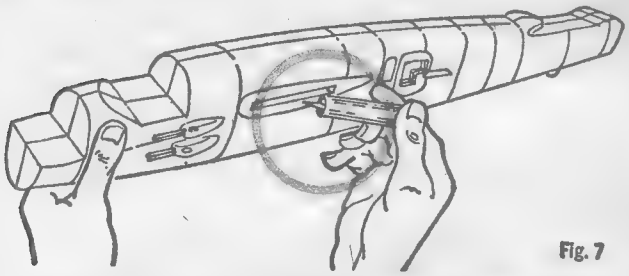


Fig. 7

Have a small cloth available to wipe up excess cement, and be careful to keep it away from eyes, clothing, and furniture. Should any cement run onto the plastic surfaces of your model, immediately immerse the part in water. This will permit you to rub the cement away without its spreading over a larger area. Polish the scar it will leave with an abrasive paste compound made of water and silver polish or a household cleanser. If the scar is deep, fill it with a paste of shavings or small scraps from the parent plastic —here's where the trees will come in handy—dissolved in a small amount of polystyrene cement. When the paste has dried in the scar, sand it smooth with very fine sandpaper. Polish it with the abrasive paste compound to restore its smooth surface.

In many kits, especially those of automobiles, metal-plated parts are used. With such parts, it is important to scrape the plating away with a razor blade or a knife in the areas where the cement is to be applied. Polystyrene ce-

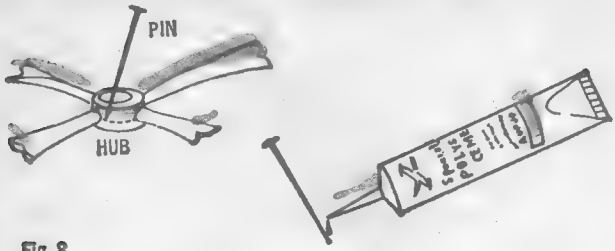


Fig. 8

ment generally will not hold on plated surfaces. When transparent parts are used, wipe them clean of all fingerprints before assembling. This is especially important on the undersurface of transparent parts which are to be cemented in place.

You may wish to stand some aircraft models on their landing gear when they are assembled rather than on their in-

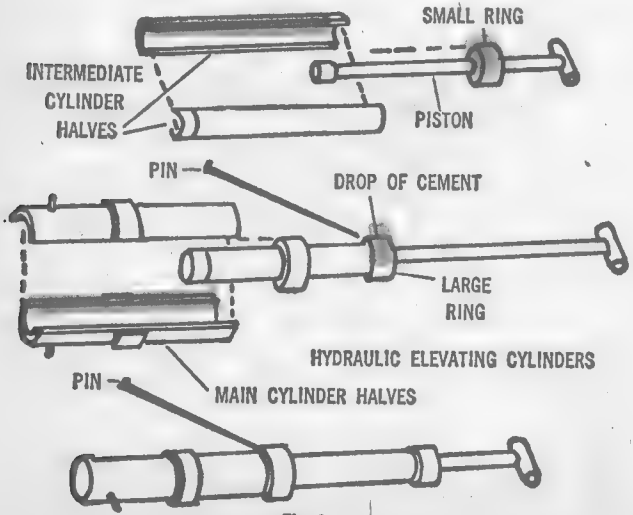


Fig. 9

flight stands. In such cases, you can place a one-half to two ounce weight of modeling clay inside the nose section of the fuselage before its halves are cemented together to counterbalance the weight of the tail. See Chapter 6 for further discussion of balancing models.

The application of cement, as shown in Figure 8, is usually recommended when cementing a propeller to its shaft or a hub cap to an axle. Apply a tiny drop of cement to a pin or toothpick, and transfer cement from the pin to the inside of the hub. Application of the cement in any other manner, or the application of too much cement, will cause it to ooze out, making the wheel or propeller immobile.

As shown in Figure 9, some models such as rockets, vertijets, and missile-launching platforms have intricate operating sub-assemblies. In order that the completed model will function properly, the hydraulic elevating cylinders should be assembled in the following manner.

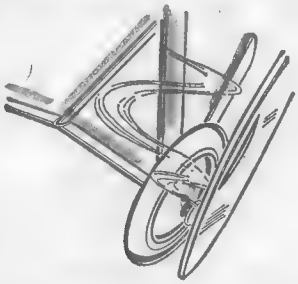


Fig. 10

First, locate the piston between the halves of the intermediate cylinder; then slip the small ring over the end of the piston rod and onto the top end of the intermediate cylinder halves until the ring hits the stop. When this has been completed, apply a small drop of cement on the end of a pin or toothpick to two or three points at the junction of the ring and the intermediate cylinder. After the cement has dried, locate the intermediate cylinder and piston between the halves of the main cylinder. Slip the large ring over the ends of the piston and the intermediate cylinder and onto the top end of the main cylinder halves until it

reaches the stop. Then, apply the cement with a pin or toothpick to the junction of the large ring and main cylinder. After the cement dries, check the operation of the hydraulic elevating cylinder and, if functioning properly, proceed to assemble the remaining portions of the model.

Often it is advisable to flatten the end of an axle or post in order to hold a wheel or similar part in place and allow it to turn freely (Figure 10). This is best accomplished by heating the blade of a knife just hot enough to soften the plastic when the blade is pressed against the end of the axle or post. Do not get the knife too hot or the plastic will stick to the metal. Never use good tableware because the heat will damage the temper and discolor the blade.

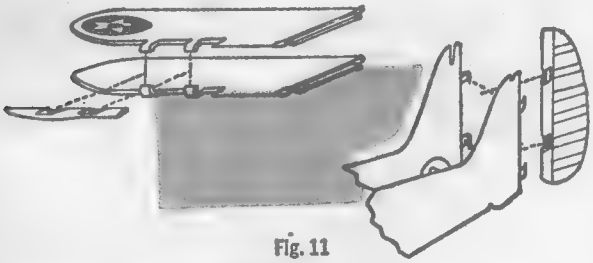


Fig. 11

In many models there are movable parts other than propellers and wheels. For example, the ailerons, stabilizers, and rudders of some models are movable. As shown in Figure 11, the wing halves are fastened together by applying cement to their inside surfaces. Be careful not to get any cement near the aileron section. Before placing the wing halves together, be sure to insert the aileron in its proper position between the "clamshell" locators at the trailing edge of the wing. Set them aside to dry. The rudder is assembled in a similar fashion. The use of clamshell locators is very common in plastic models and is used where such parts as auto doors, airplane landing wheels, and boat hatchways require hinging.

Other hinging arrangements are also used with some models. Pin hinges are often employed in plastic kits. To assemble the elevating platform and hydraulic cylinder to

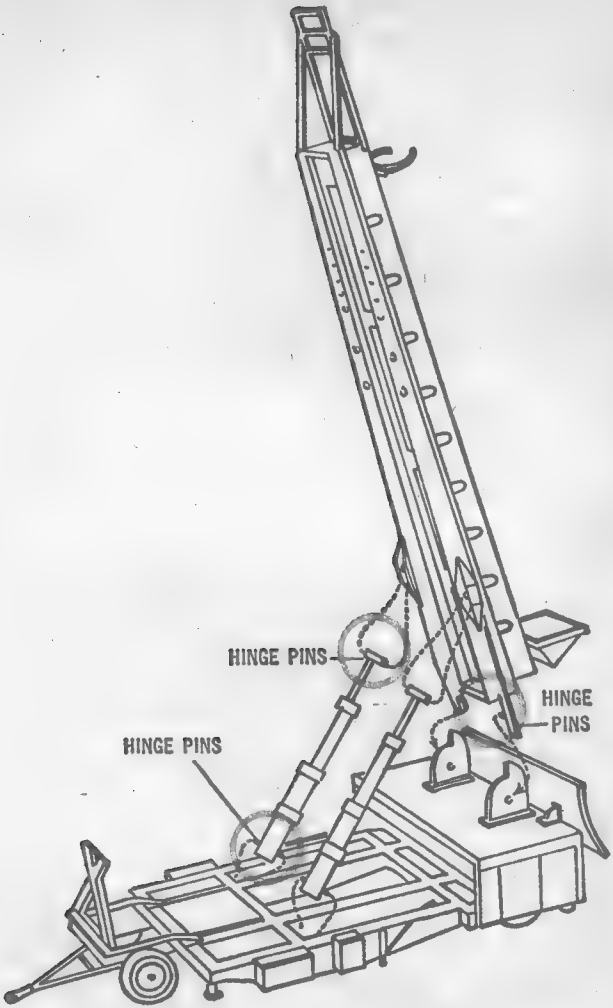


Fig. 12

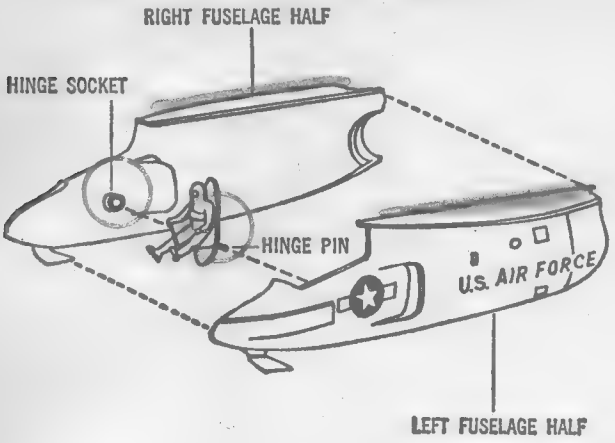


Fig. 13

the trailer chassis of the Bomarc Missile launching platform (Figure 12) the manufacturer recommends the following procedure:

1. Snap hinge pins at rear of platform into hinge sockets on launching pad of chassis. Do not cement.

2. Snap hinge pins on end of piston rod into hinge sockets on underside of platform.

3. Snap hinge pins on main cylinder into hinge sockets located between main and side rails at center of chassis.

There are other types of pin hinges but, in general, they are assembled in a manner similar to that shown in Figure 13. Before placing the fuselage halves together, locate the hinge pins on the pilot's seat in the hinge sockets on the inside of the left and right fuselage halves. Then the halves can be cemented. Pin hinges are employed in many of the same functions as those of clamshell locators.

Some manufacturers are now using pressure-sensitive tape hinges. With these, the backing of the tape hinge is removed, and halves of the hinge are placed on the pieces that are to be used. When the hinge tape is pressed down with

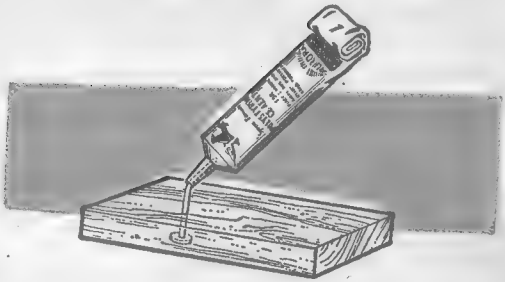


Fig. 14

finger pressure, the hinge will adhere firmly and will operate smoothly.

The cement tube should be kept tightly capped when not in use. However, it is not necessary to remove and replace the cap each time during assembly work. To avoid this, drive a small nail at an angle through a section of thin board or plywood and impale the tube on it (Figure 14). The nail should be large enough to fill the tube opening.

For neatness and maximum strength, we suggest that all

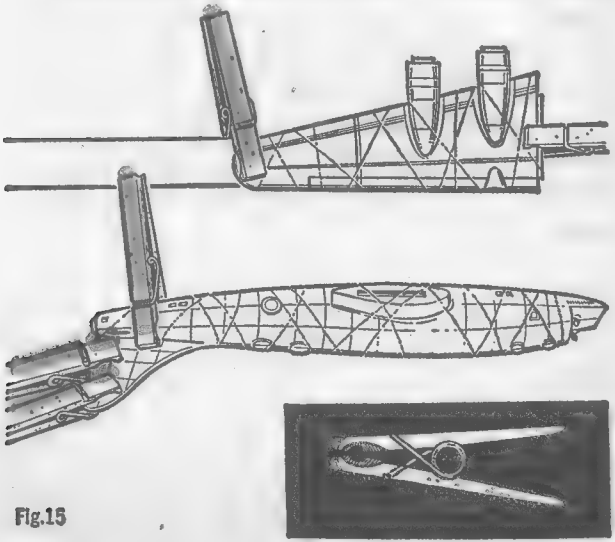


Fig.15

cemented assemblies and sub-assemblies be given ample time to dry before handling. This time may vary from several minutes to four hours depending on the size and location of the parts. Generally, small parts only need to be pressed together with the fingers for a few minutes to set. Larger parts should be held for several minutes, then clamped for several hours with rubber bands, cellulose tape, or clamps made from balsa or wood clothespins.

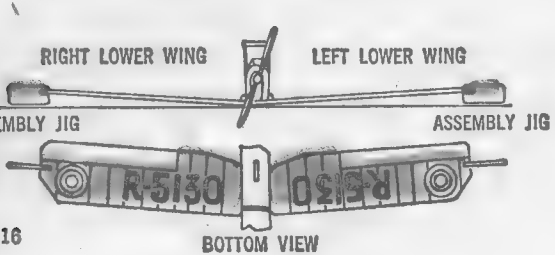


Fig. 16

Figure 15 illustrates the proper alignment of airplane parts during the cementing operation. A flat metal ruler holds the wing section straight; rubber bands and clothespins bind the two halves of the fuselage. A thin piece of wood or heavy cardboard may be substituted for the metal ruler. A spring clothespin makes an excellent temporary clamp. As shown in Figure 15, the clothespin's jaws should be partially cut away to provide a secure bite, and the nose should be rounded off.

In some jet and airplane models, the wings should have a slight upward tilt called the *dihedral*. For such a tilt, apply the cement along the inside edges of the slots in the fuselage or center wing section and insert the tabs of the wings into the slots. Then hold them firmly in position at the proper angle for a couple of minutes.

If you wish, you can make a simple assembly jig out of balsa wood or cardboard to hold the wings at their proper angle, as shown in Figure 16. A holding jig may also be formed by laying cemented parts on a block of balsa and surrounding them tightly with pins.

If it is necessary to shape the tabs to make a good butt joint when the wings are tilted, be extremely careful in cutting. Knife blades have a tendency to jump out of plastic.

When cementing the undercarriage of aircraft and its related parts, it is a good idea to prop the plane upside down until the cement has enough time to set. The box in which the kit was packed will serve as an excellent support for this purpose (Figure 17).

If cracks or open joints remain after your model is assembled, fill them with the plastic paste described on page 23. Use a cotton swab to dab the paste into the opening;

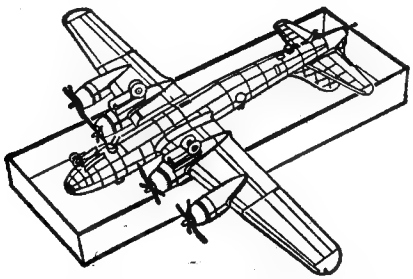


Fig. 17

allow time for drying and sand smooth with very fine sandpaper. At this time it is wise to check your model to be sure that all plastic flashing—caused by the molding process —has been removed. (To remove flashing from your model, draw a sharp razor blade or knife along the flash line, holding the blade perpendicular to the surface. This will remove the flash without any scalloping and should be done as soon as the cement has dried.)

If you have made an error in assembly, use a razor blade or a sharp knife to cut apart the pieces that are incorrectly fitted. *Never try to pry the pieces apart.* Correct the error and recement the pieces. The seam can then be repaired as described above. However, if you follow the manufacturer's instructions to the letter, this difficult task can usually be avoided.

4

THE TECHNIQUES OF ASSEMBLY

Keeping the general assembly tips discussed in the last chapter in mind, let us look at specific details of assembly for some of the popular models. As you read over the manufacturer's instructions, which we have included with the examples that follow, attempt to visualize the assembly techniques involved.

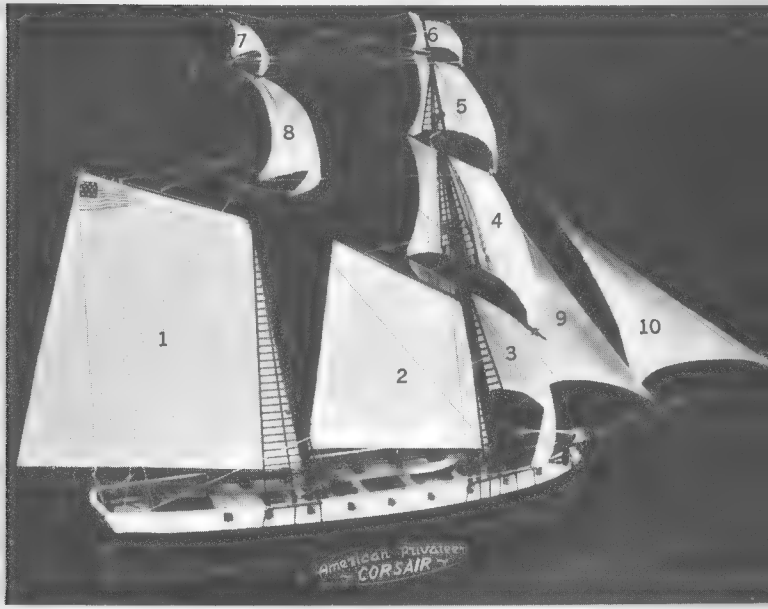
It is wise to be on the lookout at all times for tips that may help you in assembly. Instruction sheets often include valuable suggestions which may be applied to all model building. Read carefully and follow the directions in your mind as if you were doing the work with your hands. This type of practice will be a great help to you when the time comes to assemble your plastic models.

The P-38 Lockheed Lightning

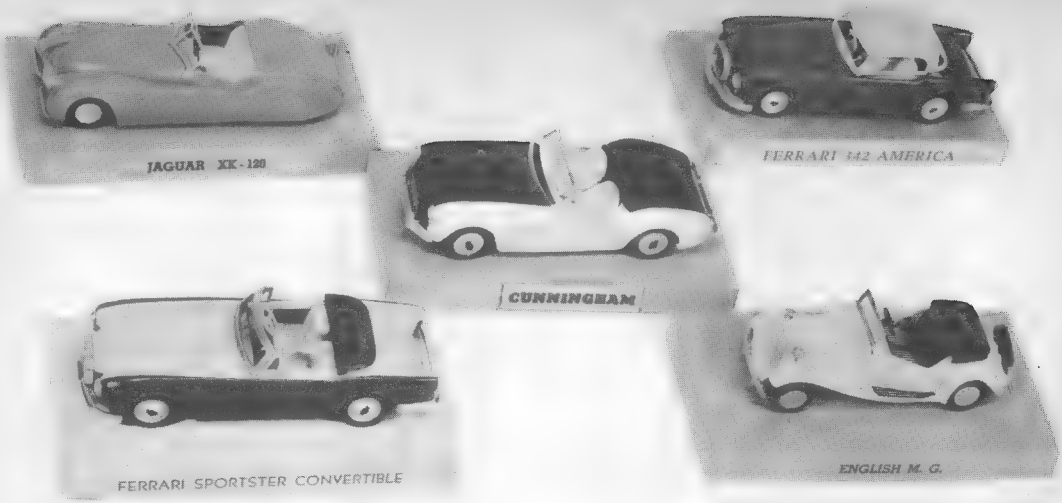
Of all the fighters of World War II, the P-38 was by far the most beautiful. This airplane—with its twin fuselages gleaming in the sun—was a comforting sight to the American bomber crews as they flew into Germany. As you can see by the working drawing (Figure 18), the scale model captures all the detail and grace of this famous American fighter. In the following instructions, the "by-the-numbers" system of identifying parts described in Chapter 3 has been used.

A. The parts of a typical plastic kit arranged for assembly.

B. The American Privateer Corsair with its standing rigging.



C. The Corsair with its sails and running rigging added. The numbers indicate the order in which the sails should be installed. See Chapter 5.



D. A collection of world-famous sports cars available in plastic kits.

E. An assembled and decorated HO-scale railroad station.

F. (Top) An AT-6 Texan model as it appears on its in-flight stand. (Bottom) A DeHavilland DH-4 World War I airplane shown on its landing gear. The ground piece adds action and excitement to the display.

G. Two ready-for-flight motorized airplane models: the British SE-5A Scout (Top) and the Little Toni—Goodyear Racer (Bottom).

H. A mounted Confederate Raider leads a charge across your den or playroom.

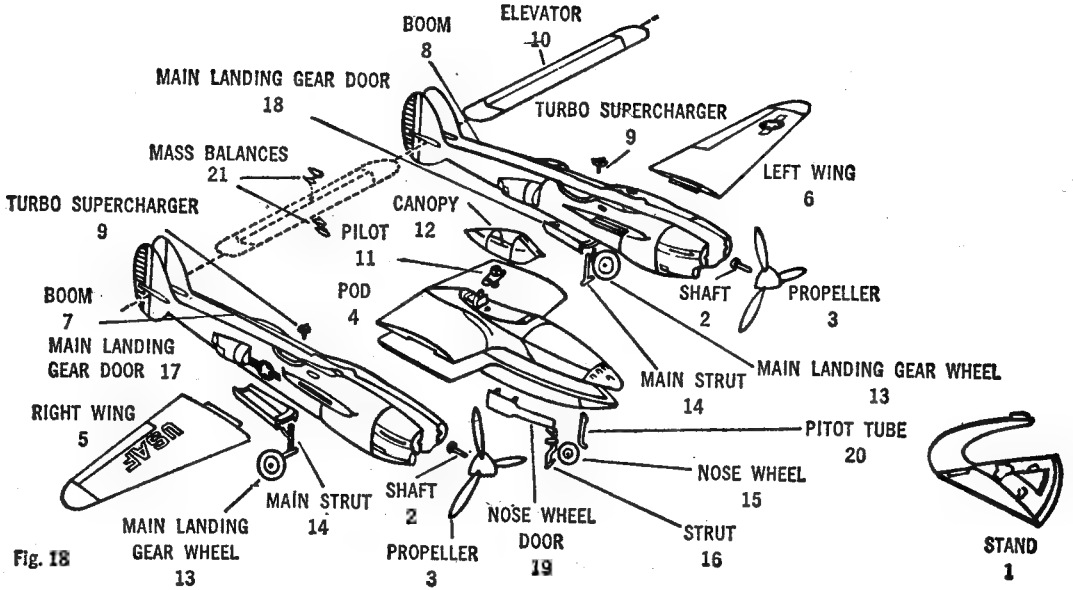

BOOM
8
ELEVATOR
10
MAIN LANDING GEAR DOOR
18
TURBO SUPERCHARGER
9
MASS BALANCES
21
LEFT WING
6
TURBO SUPERCHARGER
9
CANOPY
12
PILOT
11
POD
4
SHAFT
2
PROPELLER
3
BOOM
7
MAIN LANDING
GEAR DOOR 17
MAIN STRUT
14
MAIN LANDING GEAR WHEEL
13
RIGHT WING
5
PITOT TUBE
20
NOSE WHEEL
15
MAIN STRUT
14
SHAFT
2
NOSE WHEEL
DOOR
19
STRUT
16
MAIN LANDING
GEAR WHEEL
13
PROPELLER
3
STAND
1

Fig. 18

1. Cement both parts of in-flight stand (1) together and allow to dry.

2. Cement propeller shafts (2) to propellers (3) and allow to dry.

3. Cement pod (4) (cockpit section) together by applying cement to inside edges of pod. *Note:* If you wish to have the model stand on its landing gear when assembled, place a 1/2-ounce weight (preferably modeling clay) inside nose section of pod before cementing pod halves together. This weight will counterbalance weight of tail.

4. Cement right and left wings (5 and 6) to fuselages (7 and 8) by inserting wing tabs into slots in fuselage sections and applying cement on the inside. Set aside to dry. *Note:* Be sure that tabs and slots match so that wings are on the correct side.

5. Cement fuselages (left and right booms) and wing sub-assemblies together by applying cement to edges of fuselage halves, being careful not to get cement near or around propeller shaft hole. *Important:* Place propeller and shaft assemblies into proper position in fuselages before joining fuselages.

6. Cement turbo superchargers (9) to top of left and right booms by applying a small drop of cement to the end of the peg on bottom side of turbo superchargers; place into proper position and allow to dry.

7. Cement left and right booms (7 and 8) to pod (4) by applying cement to tabs on boom assemblies. Fit into corresponding slot in pod and allow to dry. *Note:* Cement left or right boom assembly to pod and allow to dry before cementing opposite boom.

8. To cement elevator (10) to boom and pod assembly—first insert elevator through slots in booms (7 and 8) and locate centrally, then apply cement very sparingly at junction points of elevator and slots. Allow to dry.

9. Cement pilot (11) in cockpit by applying a small drop of cement to peg on pilot. Place into proper position in cockpit and allow to dry.

10. Apply cement sparingly to edges of canopy (12) and press firmly over cockpit.

11. Cement main landing gear wheels (13) to main struts (14), as indicated in sketch, by applying a small drop of cement to peg on bottom of strut and inserting same into corresponding hole in center of wheel. Set aside to dry.

12. Using the same procedure, cement nose wheel (15) to nose wheel strut (16) and set aside to dry.

13. Cement main landing gear doors (17 and 18) to underside of left and right booms by applying cement to concave side of braces on doors. Locate same in proper position on outlined area on underside of booms as indicated in sketch. *Note:* Place doors on booms so that the narrow ends of doors are toward tail of plane.

14. Cement nose wheel door (19) to underside of pod by applying cement to braces and along bottom edge of door. Place same in proper position on outlined section on underside of pod as indicated in sketch. Hold in position for about 30 seconds to allow cement to set.

15. Cement main landing gear wheel and strut assembly to main landing gear doors by applying a small drop of cement to each of the two pegs on top of struts. Insert same into corresponding holes in brace at front end of doors.

16. Cement nose wheel and strut assembly to underside of pod by applying a small drop of cement to peg on top of strut. Insert same into corresponding hole at door outlined section of underside of pod, as indicated in sketch.

17. Cement pitot tube (20) to underside of pod by applying a small drop of cement to peg on pitot tube and inserting same into corresponding hole in underside of pod directly in front of nose wheel, as indicated in sketch.

18. Cement mass balances (21) to center of top and bottom sides of elevator, as indicated in sketch, using the same procedure as used in cementing pitot tube.

19. Cut out sections of decals to correspond with markings on plane. Apply decals carefully and allow them to dry thoroughly before further handling.

20. Apply cement to tab on leg of stand (1), insert into corresponding slot on bottom of pod (4), and hold or prop in position until dry. Allow to dry thoroughly before any further handling.

The Fokker DR-1 Triplane

When the Fokker Triplane—illustrated on the cover of this book and in Figure 19—was first introduced during World War I, it was regarded with skepticism on three counts: its three-wing design; its peculiar cantilever wing spar construction without the usual wire bracing; and its thick anti-high-speed airfoil section. But the German ace, Baron von Richthofen, proved its great ability to turn on a dime and to climb rapidly. Since the early days of model airplanes, the DR-1 Triplane has been a great favorite. Of all the airplanes of World War I, more models of this type have been built by hobbyists than any other. Here are the manufacturer's instructions for assembling this outstanding model:

1. Cement pilot to seat by applying cement to seat and back of pilot. Place pilot on seat and set aside to dry.

2. Cement pilot and seat assembly to floor panel by applying cement to bottom of seat and placing same between corresponding locating ribs on floor panel, as indicated in sketch.

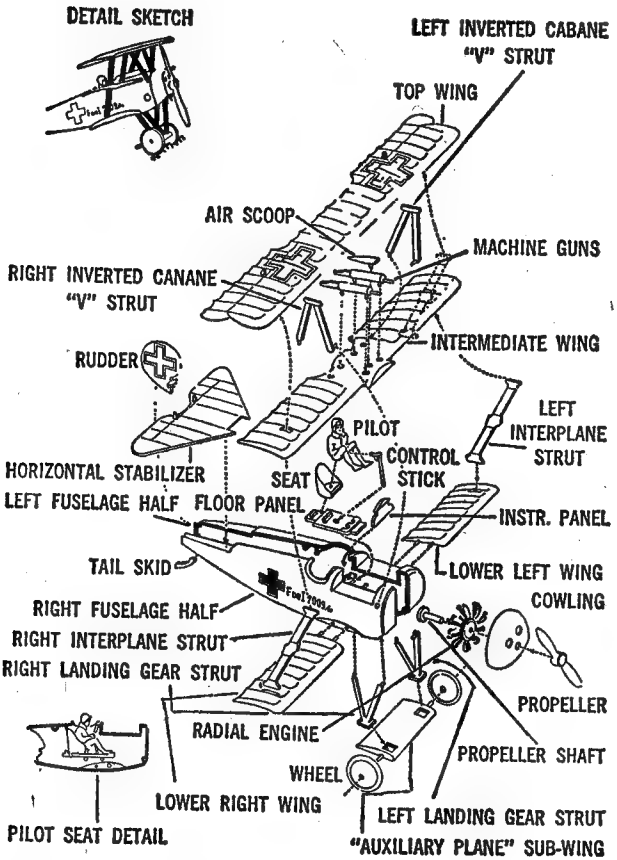
3. Cement control stick to center of floor panel by applying cement to end of control stick and inserting same into corresponding hole in floor panel. Set aside to dry.

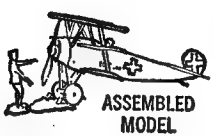
4. Cement radial engine to inside of cowling as follows: Place hole in center of engine over a toothpick or end of a pencil and apply cement very sparingly to ends of cylinders and insert into cowling. Locate carefully and remove toothpick or pencil. Allow to dry.

5. Cement propeller to propeller shaft as follows: Insert propeller shaft through hole in engine and cowling so that hub (large end of shaft) is on the inside of cowling. Place a very small drop of cement onto protruding end of shaft. Fit propeller onto shaft and set aside to dry.

6. Cement seat and floor panel assembly to right fuselage half by applying cement along right side of floor panel and locating same between pegs and ribs located in right fuselage half, as indicated in sketch.

7. Cement fuselage halves together by applying cement





CHOCK AND GROUND PANEL

Fig. 19

very sparingly along inside edges of right fuselage half. Place halves together, align carefully, and hold firmly for about 30 seconds to allow cement to set.

8. Cement instrument panel inside front end of cockpit as follows: Apply cement very sparingly to front end of cockpit—then grasp top end of instrument panel with tweezers and insert same inside cockpit so that ledge at top of back side of instrument panel rests on front edge of cockpit, as indicated in sketch.

9. Cement lower left and right wings to fuselage by applying cement sparingly to pegs on ends of wings and inserting same into corresponding holes in left and right sides of fuselage, as indicated in sketch.

10. Cement intermediate wing to fuselage by applying cement to recessed area in topside of fuselage. Place wing centrally in recessed area and press firmly into position on fuselage. Allow to dry.

11. Cement left and right interplane struts to lower wings by applying cement sparingly to bottom end of struts. Locate bottom ends of struts into slots in lower wings by passing through slotted holes in intermediate wing, as indicated in sketch.

12. Cement twin machine guns to intermediate wing by applying cement to pegs on bottom of guns and inserting same into corresponding holes located in intermediate wing directly in front of cockpit, as indicated in sketch.

13. Using the same procedure, cement air scoop between machine guns in center of intermediate wing.

14. Cement left and right inverted cabane "V" struts to fuselage by applying a small drop of cement to ends of inverted "V" and locating ends into corresponding recessed slots in fuselage and holes in intermediate wing directly in front of cockpit section, as indicated in sketch. *Note:* Longer leg of inverted "V" is toward front of plane.

15. Assemble top wing to struts as follows: Place top wing upside down on work table and apply a small drop of cement to each of the slots in top wing. Holding fuselage upside down, carefully insert, one at a time, pegs on ends of struts into corresponding slots in top wing. Allow to dry.

16. Cement cowling and engine assembly to fuselage by

applying cement very sparingly to inside edges of cowling and placing same over front end of fuselage, being careful to align slot in cowling with underside of fuselage.

17. Place plane in upside-down position and cement left and right landing gear struts to fuselage by applying cement sparingly to ends of legs of strut. Insert peg on shorter leg of strut into corresponding slot in underside of lower wing. Locate squared end of longer leg into corresponding recessed area in underside of fuselage directly behind cowling, as indicated in sketch. *Note:* If landing gear struts are located on the correct side, the tabs on the bottom ends of struts should point toward center line of plane.

18. Cement "auxiliary plane" (sub-wing) to landing gear struts and insert same into corresponding slots in auxiliary plane, as indicated in sketch. Hold in position until cement has had time to set.

19. Cement wheels to axles by applying a small drop of cement to ends of axle and locating hole in wheels over same. Allow to dry.

20. Cement tail skid to fuselage by applying cement to tab on back end of skid and inserting same into corresponding rectangular slot in underside of tail of fuselage.

21. Cement horizontal stabilizer to fuselage by applying cement to recessed area on underside of stabilizer and locating same over corresponding recessed area at tail of fuselage.

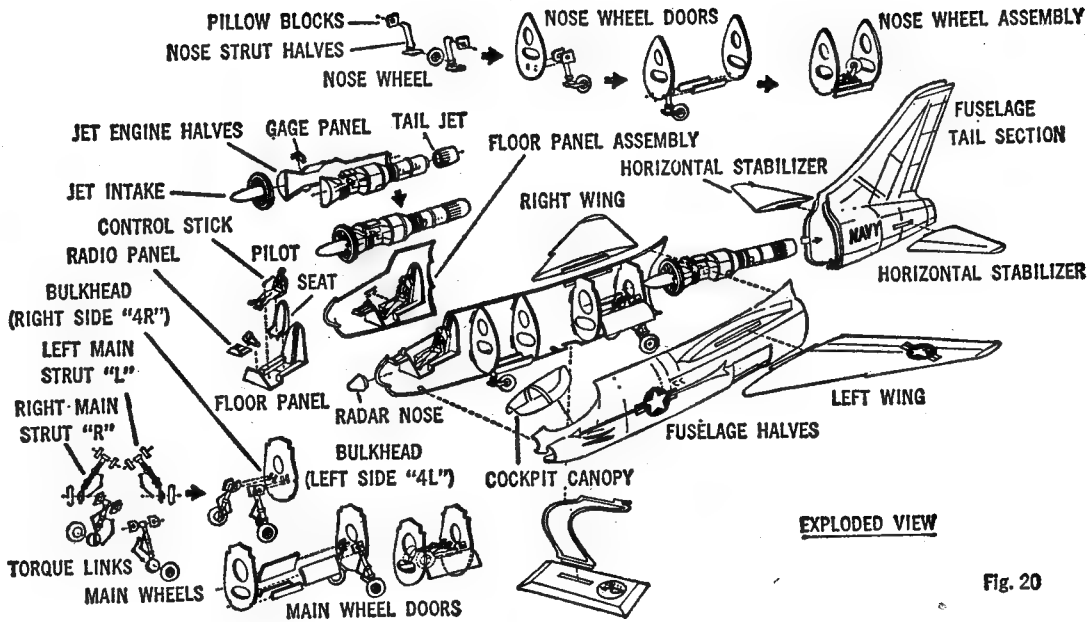
22. Cement rudder to fuselage by applying cement to tab at front section of rudder and locate same on step at tail of fuselage, as indicated in sketch. Hold firmly in position for about 30 seconds to allow cement to set.

23. Cement mechanic to wheel chock and ground panel by applying a small drop of cement to peg on bottom of left foot of mechanic and inserting same into corresponding hole in chock and ground panel.

24. Cut out sections of decals to correspond with markings on plane and then apply decals.

The Chance Vought F8U-1 "Crusader"

Jets are not only the most recent development in air



EXPLODED VIEW

Fig. 20

travel, they are also the latest models to take the hobbyist's fancy. The Crusader illustrates the amount of detail that can go into a plastic scale model (see Figure 20). Although detail and moving parts are extensive, the instruction sheet makes the assembly work easy:

1. Locate and cement jet engine halves together.
2. Locate and cement jet intake to front of jet engine.
3. Locate and cement tail jet to back of jet engine.
4. Locate and cement gauge panel to top of jet engine. Set aside to dry.
5. Locate and cement seat to floor panel.
6. Locate and cement pilot to seat.
7. Locate and cement control stick to floor panel.
8. Locate and cement instrument panel to front of floor panel.
9. Locate and cement radio panel to front of instrument panel.
10. Locate and cement floor panel assembly to locating ribs inside right fuselage half.
11. Locate and cement main wheels to left and right main struts.
12. Locate and cement torque links to left and right main struts.
13. Locate, but do not cement, pillow blocks on axle of left main strut (marked L), and cement tabs on pillow blocks to slots on left side of bulkhead (marked 4L).
14. Locate, but do not cement, pillow blocks on axle of right main strut (marked R), and cement tabs on pillow blocks to slots on right side of bulkhead (marked 4R).
15. Assemble, but do not cement, hinge pins on main wheel doors into holes in bulkheads. *Note:* Be careful to assemble bulkheads to doors so that left sides of bulkheads are on the same side.
16. Locate main bulkhead assembly between ribs in right fuselage so that markings on bulkheads correspond with markings on inside of fuselage.
17. Locate nose wheel between nose strut halves and cement halves together.
18. Locate, but do not cement, pillow blocks on axle of nose strut and cement tabs on pillow blocks to slots in bulk-

head. Set assembly aside to dry.

19. Assemble, but do not cement, hinge pins on nose wheel doors into holes in bulkheads. *Note:* Be careful to assemble bulkheads to doors so that left side of bulkheads are on the same side.

20. Locate nose bulkhead assembly between ribs in right fuselage so that markings on bulkheads correspond with markings on inside of fuselage.

21. Cement fuselage halves together by applying cement sparingly to inside edges of left fuselage half. Place halves together, being careful not to disturb the location of the bulkheads, and hold halves firmly together for at least one minute to allow cement to set.

22. Locate and cement radar nose to nose of fuselage.

23. Locate and cement left and right wings to fuselage.

24. Locate and cement canopy over cockpit of fuselage.

25. Locate and cement halves of fuselage tail section together.

26. Locate and cement horizontal stabilizers to fuselage tail section.

27. Insert jet engine, but do not cement, into tail section and snap tail section onto main section of fuselage.

28. Cut out sections of decals to correspond with markings on model and apply where needed.

The Kaman Hok-1 Helicopter

No discussion of model aircraft would be complete without the inclusion of "whirlybirds." We have selected the Kaman Hok "Egg Beater" (Figure 21) because it illustrates an important assembly feature—rotor blades. Here are the manufacturer's instructions for assembling this popular helicopter:

1. Cement left pylon to left fuselage half by applying cement to bottom edges of pylon and placing same over corresponding recessed area on top of fuselage. *Note:* Slot on side of pylon must face toward inside of fuselage, as indicated in sketch. Repeat same procedure to cement right pylon to right fuselage half.

2. Insert rotor shafts through holes in top of pylons. Ce-

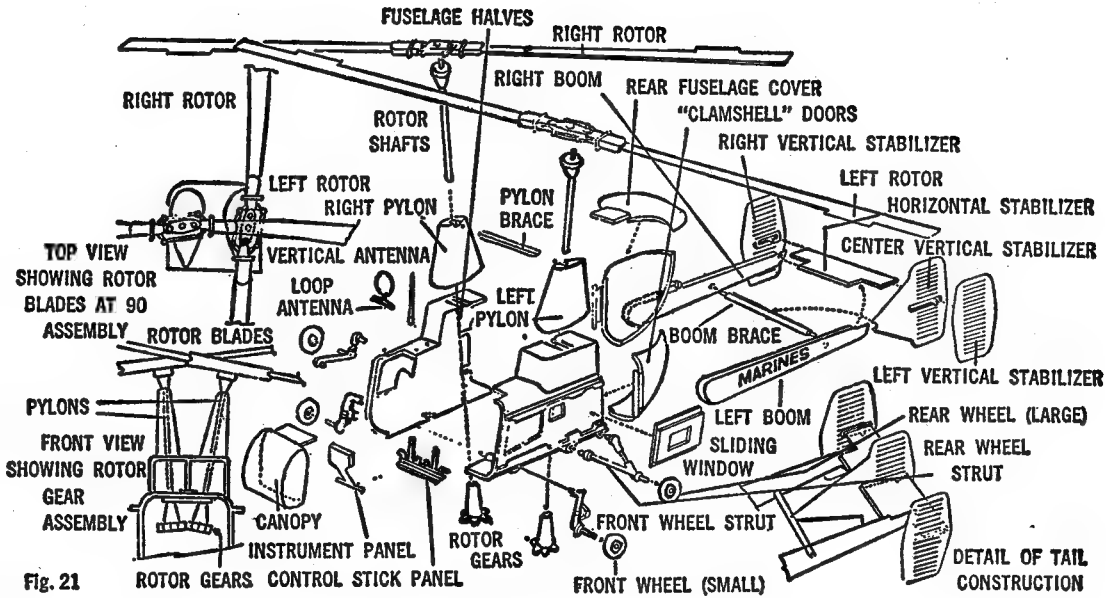

FUSELAGE HALVES
RIGHT ROTOR
RIGHT ROTOR
RIGHT BOOM
REAR FUSELAGE COVER
"CLAMSHELL" DOORS
ROTOR SHAFTS
RIGHT VERTICAL STABILIZER
LEFT ROTOR
RIGHT PYLON
PYLON BRACE
LEFT ROTOR
HORIZONTAL STABILIZER
TOP VIEW SHOWING ROTOR BLADES AT 90 ASSEMBLY
VERTICAL ANTENNA
LOOP ANTENNA
CENTER VERTICAL STABILIZER
LEFT PYLON
ROTOR BLADES
BOOM BRACE
MARINES
LEFT VERTICAL STABILIZER
PYLONS
LEFT BOOM
REAR WHEEL (LARGE)
FRONT VIEW SHOWING ROTOR GEAR ASSEMBLY
SLIDING WINDOW
REAR WHEEL STRUT
CANOPY
FRONT WHEEL STRUT
INSTRUMENT PANEL
ROTOR GEARS
ROTOR GEARS
CONTROL STICK PANEL
FRONT WHEEL (SMALL)
DETAIL OF TAIL CONSTRUCTION

Fig. 21

ment rotor gears to end of rotor shafts protruding on inside of fuselage halves by applying a small drop of cement to end of propeller shafts and inserting same into corresponding holes of gears.

3. Cement fuselage halves together by applying cement along inside edges of left fuselage half. Place halves together, align carefully, and hold firmly for about one minute to allow cement to set.

4. Cement pylon brace to pylons by applying a small drop of cement to tabs on ends of brace and placing same into corresponding slots at top of inner sides of pylons, as indicated in sketch.

5. Cement instrument panel to control sticks by applying cement to tab on bottom of instrument panel and place same centrally on ledge at base of control sticks, as indicated in sketch.

6. Cement instrument panel and control stick assembly to inside of fuselage by applying cement to bottom of control stick panel; then, through opening at front end of fuselage place bottom end of control stick panel in recessed area directly in front of seats.

7. Cement left and right booms to fuselage by applying cement to pegs on inside front end of booms and inserting same into corresponding holes in left and right sides of fuselage.

8. Cement boom brace to booms by applying cement to ends of brace and inserting same into corresponding recessed holes located at center of inside surfaces of booms, as indicated in sketch.

9. Insert horizontal stabilizer through corresponding slot in center vertical stabilizer; locate centrally and apply cement very sparingly to junction point of horizontal and vertical stabilizer.

10. Cement horizontal and center vertical stabilizer assembly to booms by applying a small drop of cement to top notched ends of booms and to center of boom brace. Place "V" at front end of vertical stabilizer at center of back end of boom brace and bottom of horizontal stabilizer on notched ends of booms, as indicated in sketch. Hold in position for about 30 seconds to allow cement to set.

11. Cement left and right vertical stabilizer to ends of horizontal stabilizer by applying cement to left and right ends of horizontal stabilizer and inserting same into corresponding slots in left and right vertical stabilizers, as indicated in sketch.

12. Cement rear fuselage cover to fuselage by applying cement to tab at front of cover and locating same into corresponding recessed slot in underside of boom at rear of fuselage, as indicated in sketch.

13. Assemble left and right rear clamshell doors to fuselage as follows: Hold the fuselage with one hand and one of the clamshell doors with the other hand. Then, press upper and lower hinge pins on doors into slotted opening of hinge sockets at rear of fuselage body. Push hinge pin gently but firmly into slotted socket until it clicks into place. Repeat for other door.

14. Assemble sliding windows to fuselage body by sliding windows into channels in sides of fuselage body through opening in center section of runners, as indicated in sketch.

15. Cement canopy to fuselage by applying cement very sparingly to edges of canopy and placing same over front end of fuselage, as indicated in sketch.

16. Cement vertical antenna and loop antenna to top of fuselage by applying a small drop of cement to pegs on antennae and locating same on roof of fuselage, as indicated in sketch.

17. Cement front (small) and rear (large) wheels to front and rear struts, as indicated in sketch, by applying a small drop of cement to axles on struts and inserting same into corresponding holes in wheels.

18. Cement left and right front and rear wheel strut assemblies to fuselage by applying a small drop of cement to pegs at top ends of struts and inserting same in corresponding holes in left and right sides of fuselage, as indicated in sketch.

19. To assemble the intermeshing rotors correctly for proper and smooth operation, it is very important that assembly be accomplished exactly as follows: (a) Apply cement to peg on top of right rotor shaft, and insert into hole in center of right rotor. (b) Turn right rotor so that it is par-

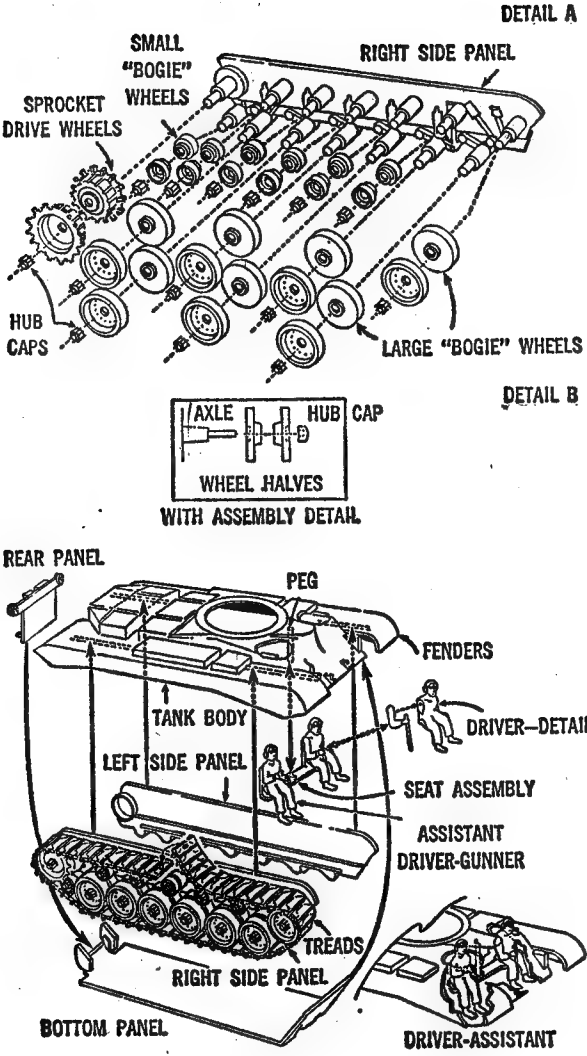

DETAIL A
SMALL "BOGIE" WHEELS
RIGHT SIDE PANEL
SPROCKET DRIVE WHEELS
HUB CAPS
LARGE "BOGIE" WHEELS
DETAIL B
AXLE
HUB CAP
WHEEL HALVES
WITH ASSEMBLY DETAIL
REAR PANEL
PEG
FENDERS
TANK BODY
DRIVER—DETAIL
LEFT SIDE PANEL
SEAT ASSEMBLY
ASSISTANT DRIVER-GUNNER
TREADS
RIGHT SIDE PANEL
BOTTOM PANEL
DRIVER-ASSISTANT DETAIL

Fig. 22

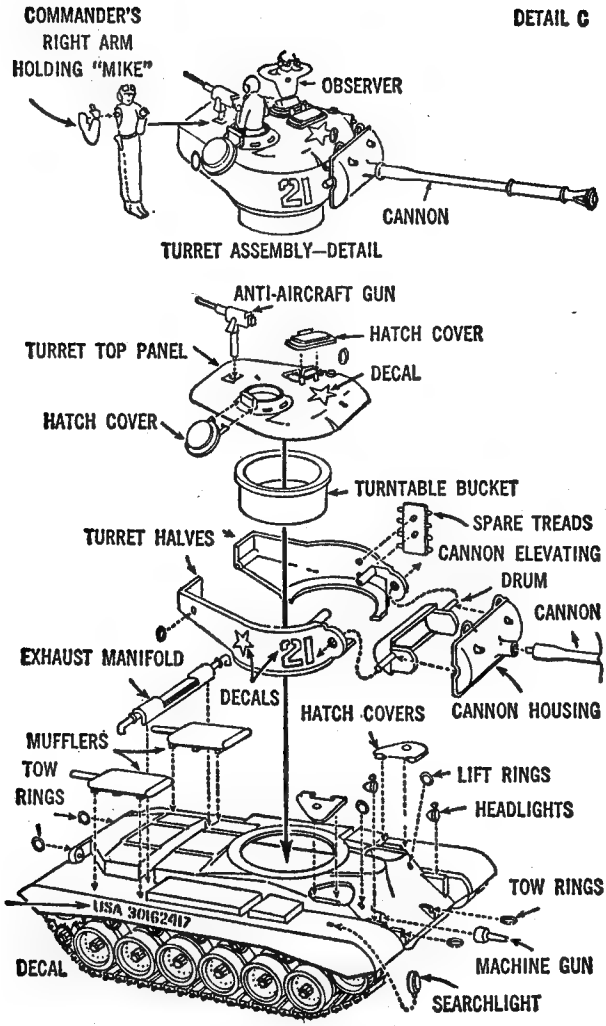

COMMANDER'S RIGHT ARM HOLDING "MIKE"
DETAIL C
OBSERVER
21
CANNON
TURRET ASSEMBLY—DETAIL
ANTI-AIRCRAFT GUN
HATCH COVER
TURRET TOP PANEL
DECAL
HATCH COVER
TURNTABLE BUCKET
SPARE TREADS
TURRET HALVES
CANNON ELEVATING
DRUM
CANNON
EXHAUST MANIFOLD
21
DECALS
HATCH COVERS
CANNON HOUSING
MUFFLERS
TOW RINGS
LIFT RINGS
HEADLIGHTS
TOW RINGS
USA 30162417
DECAL
MACHINE GUN
SEARCHLIGHT

Fig. 22

allel (in line) with the center line of fuselage. Then, with right rotor in this position, cement left rotor to left rotor shaft at an exact right angle (90°) to the right rotor, as indicated in sketch.

20. Cut out sections of decals to correspond with markings as indicated in sketch. *Note:* Decal sheet contains extra markings enabling you to make any service version desired —Air Force, Army, Navy, or Marines.

The M-46 "General Patton" Tank

The "Patton" tank was considered the world's best medium tank of its time and is now one of the finest models. The tank is illustrated in Figure 22.

1. Assemble a pair of sprocket drive wheels (with wheel hubs facing each other) onto rear axle of left and right side panels, as indicated in Detail A. Then, apply cement to inside of hub cap, being careful not to use too much cement, so that wheels turn freely and only the hub caps are cemented to the axles. Application of cement in any other manner, or application of too much cement, will cause cement to ooze out of hub cap holes and onto wheels and axles. This will cement wheels to axles and prevent them from turning freely. *Remember:* A tiny drop of cement is more than enough.

2. Using the same procedure, assemble 7 pairs of large "bogie" wheels, with wheel hubs facing each other, onto the 6 bottom axles, and onto the front axle at each side panel. Then cement hub caps to axles, as indicated in Detail A.

3. In the same way, assemble 6 pairs of small bogie wheels to 5 top axles and to axle located between sprocket wheel and large bogie wheel at rear of side panels. Cement hub caps to axles, as indicated in Detail A.

4. Assemble flexible treads on side panel wheel assembly as follows: Wrap treads around wheels so that square pegs on underside of treads fit between inner and outer wheels. Then, join ends of treads together by pressing round peg on one end of treads into corresponding hole on other end of treads, as indicated in Detail B.

5. Cement left and right side panel assemblies to tank

body by applying cement to top edges of side panels. Place side panels between locating ribs in underside of tank body, as indicated in Detail B. Be careful to align contour of front end of side panels with contour of front end of fenders. Set assembly aside to dry.

6. Cement right arm holding control stick to right shoulder of driver by applying a small drop of cement to hole at top end of right arm and placing same over corresponding peg at right shoulder of driver, as indicated in Detail B.

7. Cement driver to left seat of seat assembly by applying cement to seat and back of driver, as indicated in Detail B.

8. Similarly, cement assistant driver-gunner to right side of seat assembly and allow to dry.

9. Cement driver and seat assembly to inside of tank body by applying cement between ribs in center of connecting bar of seat assembly. Place same onto peg on inside of front end of tank body so that driver's and assistant driver's heads protrude through hatch openings, as indicated in Detail B.

10. Cement bottom panel to side panels, as indicated in Detail B, by applying cement along recessed ledge on inside of side panels and along bottom edges of front section of tank body. Locate bottom panel on recessed ledge on inside of side panels. Carefully align front end of bottom panel with front end of tank body. Hold in position for about 60 seconds to allow cement to set.

11. Cement rear panel to rear of tank body, as indicated in Detail B, by applying cement to rear edges of tank body. Locate rear panel in proper position, align carefully, and allow to dry.

12. Cement exhaust mufflers to top of tank body by applying cement sparingly to ribs on underside of mufflers and placing same in proper position on left and right sides at top of tank body, as indicated in Detail C.

13. Cement exhaust manifold on top of tank body by applying cement to bottom edges of manifold. Place same in recessed slot between mufflers at top of tank body, as indicated in Detail C. Set assembly aside to dry.

14. Cement turret halves together by applying cement sparingly along inside edges of halves. *Important:* Before placing turret halves together, insert pegs on cannon ele-

vating drum into corresponding holes in "ears" at front end of turret halves, as indicated in Detail C. Place halves together and hold firmly for about 30 seconds to allow cement to set.

15. Cement turntable bucket to inside of turret by applying cement very sparingly along inside edges of large hole in bottom of turret. Insert turntable bucket into hole in turret so that flange of bucket is on the inside of turret, as indicated in Detail C. Allow to dry.

16. Cement turret top panel to turret by applying cement along top inside edges of turret halves assembly. Place turret top panel on same; align carefully and allow to dry.

17. Cement cannon barrel to cannon housing by applying cement to peg at back end of barrel and inserting same into corresponding hole in cannon housing.

18. Cement cannon housing to cannon elevating drum by applying cement between locating ribs on each end of inside of cannon housing. Locate same over quarter round tabs at open end of cannon elevating drum, as indicated in Detail C.

19. Cement anti-aircraft gun to turrret by applying a small drop of cement to peg on bottom of gun and inserting same into corresponding hole in top of turret.

20. Cement spare treads to turret by applying a small drop of cement to pegs on back of spare treads and inserting same into corresponding holes in left side of turret.

21. Carefully press hinge pins on round and oval hatch covers into corresponding hinge sockets in turret top. Similarly, assemble left and right front hatch covers to tank body, as indicated in Detail C.

22. Cement right arm with microphone to right shoulder of tank commander, as indicated in Detail C.

23. Open hatch covers on turret and insert tank commander and observer into corresponding hatches, as indicated in Detail C.

24. Cement lift rings and/or tow rings to turret and tank body, as indicated in Detail C, by applying a small drop of cement to one end of rings and locating same into corresponding recessed slots in turret and tank body. See sketch for location and position of rings.

25. Cement headlights to front end of tank by applying a small drop of cement to pegs on headlights and inserting same into corresponding holes between fenders at front end of tank, as indicated in Detail C.

26. Using the same procedure, cement searchlight to right front fender of tank.

27. Cement bow machine gun to front end of tank by applying a small drop of cement to back of machine gun and locating same on corresponding round section directly in front of the assistant driver-gunner, as indicated in Detail C.

28. Insert bottom of turret assembly into corresponding opening in top of tank chassis. Do not cement.

29. Cut out sections of decals to correspond with markings indicated in sketch. Read directions on back of decals before applying. Allow to dry before any further handling.

The Cutty Sark

Ships are traditional favorites with model building enthusiasts. We have selected the *Cutty Sark,* one of history's famous merchant ships, to illustrate this class of models. For the working diagrams, see Figure 23.

1. Cement 4 sides of stand together.

2. Cement deck between locating ribs on inside of either left or right hull half.

3. Cement left and right hull halves together.

4. Cement bowsprit to bow.

5. Cement left and right bow extensions to bow of hull.

6. Cement figure head to bow extension. At this point, it is advisable to rest hull on stand in order to hold hull erect for ease in assembling all remaining parts.

7. Cement stern cabin wall sides to stern section of deck.

8. Cement stern cabin roof to stern cabin walls.

9. Cement main cabin halves together and cement assembly to forward section of deck.

10. Cement midships cabin halves together and cement assembly to mid-section of deck.

11. Cement pilot's wheel to wheel house of stern section of deck.

12. Cement companionway to center of front section of

DETAIL A

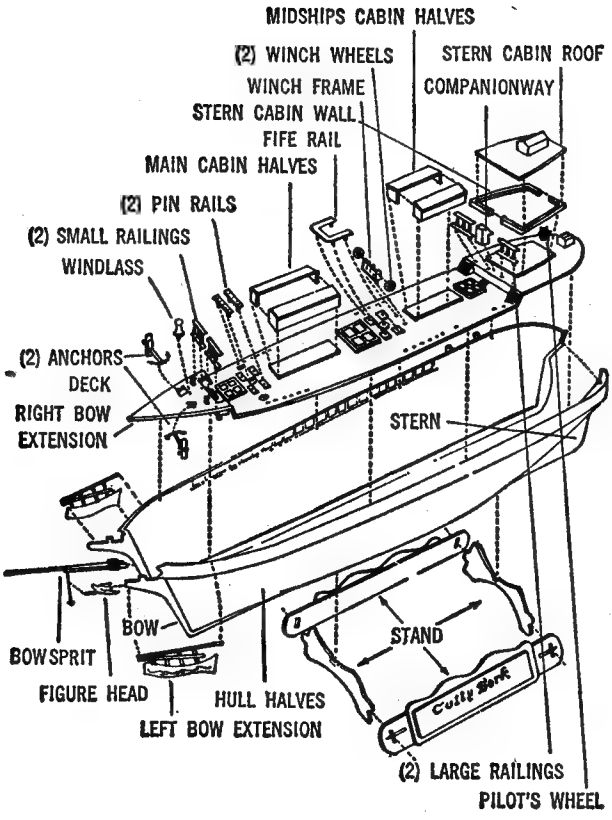


Fig. 23

DETAIL B

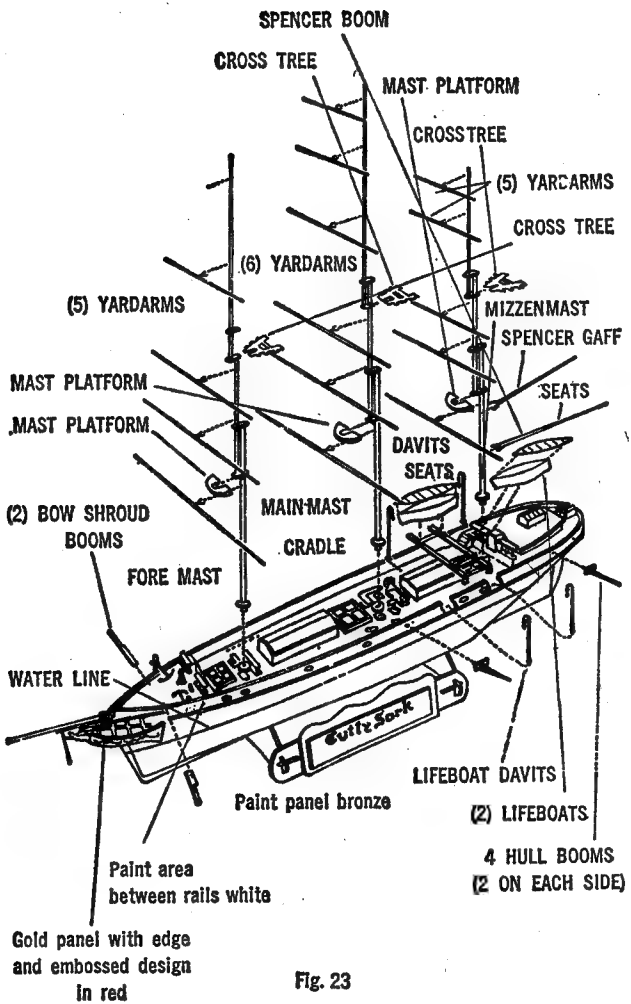


Fig. 23

stern cabin roof.

13. Cement 2 large railings to stern section of deck.

14. Cement 2 small railings to bow section of deck.

15. Cement winch frame to mid-section of deck.

16. Cement 2 winch wheels to left and right sides of winch frame.

17. Cement fife rail to center section of deck.

18. Cement 2 pin rails to forward section of deck directly in front of main cabin.

19. Cement windlass to bow section of deck.

20. Cement 2 anchors to anchor cradles at bow section of deck.

21. Cement mizzenmast (shortest mast) to stern section of deck.

22. Cement mainmast (longest mast) to center of deck.

23. Cement foremast (middle-size mast) to forward section of deck.

24. Cement 3 mast platforms, one to each of front end of main, mizzen, and foremasts.

25. Cement 3 crosstrees, one to each of back end of main, mizzen, and foremasts.

26. Pick out the group of 6 yardarms and cement to front end of mainmast (center mast) with the progressively longer yardarms in order of size.

27. Pick out the group of 5 larger yardarms. These are the foremast yardarms. Cement to front end of foremast in order, with shortest at top and longest at the bottom.

28. Repeat same procedure for cementing group of 5 smaller yardarms to mizzenmast.

29. Cement spencer boom to lower end of mizzenmast.

30. Cement spencer gaff to mizzenmast.

31. Cement lifeboat cradle to left and right hull railings between main and mizzenmasts.

32. Cement lifeboat seats to lifeboats.

33. Cement lifeboats to lifeboat cradles.

34. Cement 4 lifeboat davits to left and right sides of deck.

35. Cement 4 hull booms, 2 to each side of hull.

For greater authenticity, the *Cutty Sark* can be rigged. You will find instructions for rigging in Chapter 5.

The U.S.S. Halford

All model makers sooner or later will want to assemble a famous warship. To show you how one is put together, we have selected the U.S.S. *Halford,* a first-class fighting ship of the Navy. The kit includes the armament, superstructure, radar, searchlight, seaplane, and other features carried by the destroyer. The complete kit model shown in Figure 24 is 15 inches in length. To assemble the U.S.S. *Halford,* the following instructions are recommended by its manufacturer:

1. Cement main deck to hull by applying cement to top edges of hull. Place main deck in proper position on hull and hold deck firmly to hull contour for about 30 seconds to allow cement to dry. Cement rudder to hull by applying cement to peg on rudder. Place peg in appropriate hole in stern and allow to dry.

2. Cement superstructure front section to main deck by applying cement to pegs and bottom edges of superstructure section. Place pegs into appropriate holes in main deck. Press firmly in place and allow to dry.

3. Cement gun deck to superstructure by applying cement to top edges of superstructure. Place gun deck into proper position on superstructure. Press firmly in place and allow to dry.

4. Cement pilot house to gun deck by applying cement to pegs and bottom edges of pilot house. Place pegs into appropriate holes in gun deck and allow to dry.

5. Cement short funnel halves and long funnel halves together by applying cement to inside edges of funnels. Place together, align halves carefully, and allow to dry.

6. Cement short funnel to pilot house by applying cement to bottom edge of short funnel assembly. Place into appropriate oval slot in pilot house and allow to dry.

7. Cement long funnel to gun deck using same procedure as for short funnel. Place into appropriate oval slot in gun deck.

8. Cement seaplane wing to seaplane by applying a small drop of cement to slot on bottom side of seaplane fuselage.

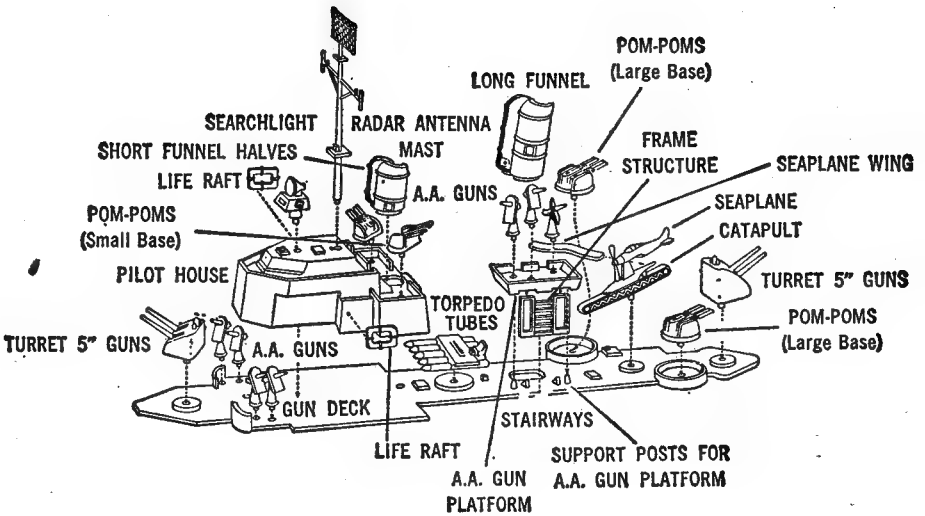

POM-POMS
(Large Base)
LONG FUNNEL
SEARCHLIGHT
RADAR ANTENNA
MAST
SHORT FUNNEL HALVES
LIFE RAFT
A.A. GUNS
FRAME
STRUCTURE
SEAPLANE WING
SEAPLANE
CATAPULT
POM-POMS
(Small Base)
PILOT HOUSE
TURRET 5" GUNS
TORPEDO
TUBES
POM-POMS
(Large Base)
TURRET 5" GUNS
A.A. GUNS
GUN DECK
STAIRWAYS
LIFE RAFT
SUPPORT POSTS FOR
A.A. GUN PLATFORM
A.A. GUN
PLATFORM

Fig. 24

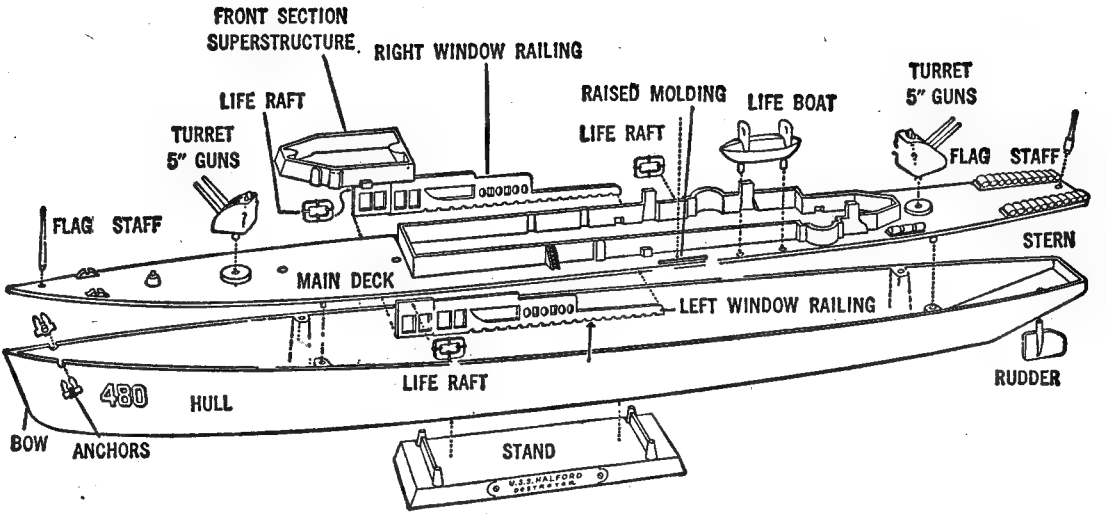

FRONT SECTION
SUPERSTRUCTURE
RIGHT WINDOW RAILING
LIFE RAFT
TURRET
5" GUNS
RAISED MOLDING
LIFE RAFT
LIFE BOAT
TURRET
5" GUNS
FLAG STAFF
FLAG STAFF
STERN
MAIN DECK
LEFT WINDOW RAILING
LIFE RAFT
RUDDER
480
HULL
BOW
ANCHORS
STAND
U.S.S. HALFORD
DESTROYER

Fig. 24

Place wing into slot and set aside to dry.

9. Cement radar antenna mast to pilot house by applying cement to bottom of mast and place in appropriate hole in pilot house, as indicated in sketch.

10. Cement searchlight to pilot house using same procedure as for radar antenna mast.

11. Cement frame structure to anti-aircraft gun platform by applying cement in wide slots of platform. Place appropriate end of frame structure into slots of platform and at right angle to platform, as indicated in sketch, and allow to dry.

12. Cement anti-aircraft gun platform and frame structure sub-assembly to gun deck and main deck by applying cement to platform support posts on gun deck and outside edge of raised molding on main deck. Carefully place assembly into position so that bottom edge of frame structure rests against raised molding on main deck and platform rests on raised pegs of gun deck. Be careful to align narrow slots in back side of platform with stairways on gun deck.

13. Cement anti-aircraft machine guns to gun deck and anti-aircraft gun platform as indicated in sketch, by applying cement to peg on bottom of anti-aircraft guns. Place into appropriate holes, pointing guns away from center of ship.

14. Cement lifeboat to main deck by applying cement to pegs on bottom of lifeboat and placing same into appropriate holes in main deck.

15. Cement right and left window railing to main deck and superstructure by applying cement to top and bottom edges of railings. Locate in proper position on main deck and against superstructure. Allow to dry. *Note:* It is suggested that the railings be first fitted into proper position without any cement so that the exact location and the points at which cement is to be applied are determined.

16. Cement life rafts to sides of pilot house, railings, and superstructure at points indicated in sketch by applying a small drop of cement to back of life raft. Place into proper position and hold for a few seconds to allow cement to dry.

17. Cement bow flagstaff and stern flagstaff to main deck by applying cement to pegs on end of flagstaffs. Place into

appropriate holes in main deck.

18. Cement anchors to bow by applying cement to pegs on anchors and placing pegs into appropriate holes in bow.

19. Insert 5-inch guns (U-shaped piece) into slots in turret. *Note:* This is a friction fit. It must not be cemented so that guns may be raised or lowered in turret. Insert pegs of turret assemblies into appropriate holes in main deck and gun deck, as indicated in sketch. Do not cement so that turrets may be rotated.

20. Insert pegs of large base pom-poms into appropriate holes in gun deck in position indicated in sketch. Do not cement in order that pom-poms may be rotated.

21. Insert pegs of small base pom-poms into appropriate holes in pilot house on each side of short funnel. Do not cement.

22. Insert peg on bottom of torpedo tubes into appropriate hole in gun deck in position indicated in sketch. Do not cement.

23. Insert peg of seaplane catapult assembly into appropriate holes in gun deck in position indicated in sketch. Do not cement in order that catapult may be rotated.

24. Cut out sections of decals to correspond with markings indicated in sketch for hull and stand. Read instructions on back of decals before applying. Allow decals to dry thoroughly before further handling.

25. Place completed model of destroyer on stand and avoid further handling for a few hours to allow cement to dry thoroughly and achieve maximum strength.

The S.S.N. Seawolf

With America's great interest in the control of the sea, it is no wonder that the guardians of the seaways—the atomic submarines—are extremely popular models. We have chosen the *Seawolf,* shown in Figure 25, to illustrate this category.

1. Cement hull halves together by applying cement along inside edges of either hull half. Place halves together and hold firmly for at least sixty seconds to allow cement to set.

2. Locate and cement left and right bow diving planes to bow of hull.

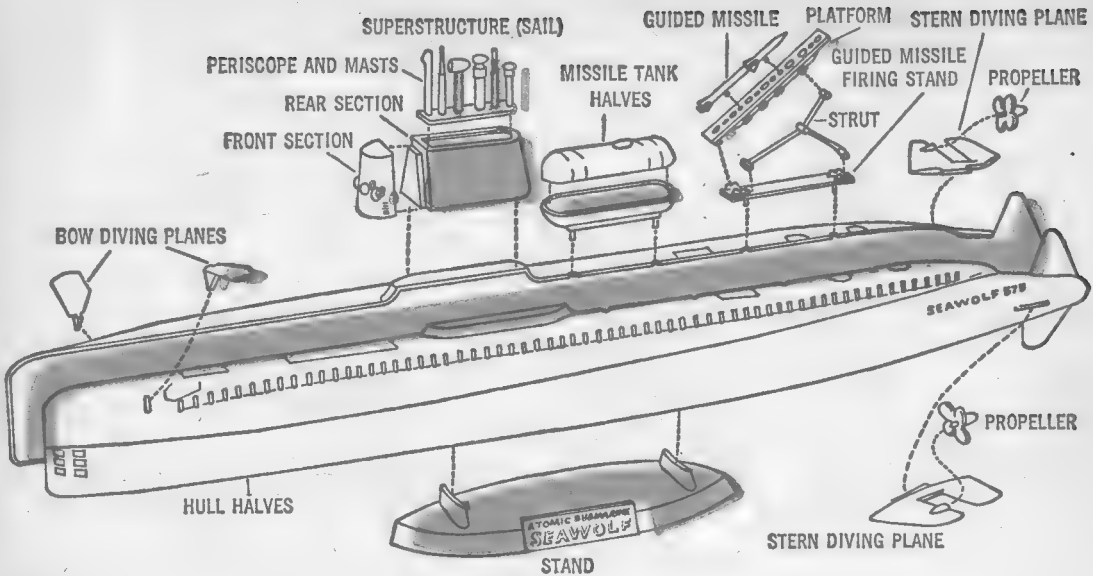

SUPERSTRUCTURE (SAIL)
GUIDED MISSILE PLATFORM
STERN DIVING PLANE
PERISCOPE AND MASTS
MISSILE TANK HALVES
GUIDED MISSILE FIRING STAND
PROPELLER
REAR SECTION
STRUT
FRONT SECTION
BOW DIVING PLANES
SEAWOLF SS 575
PROPELLER
HULL HALVES
ATOMIC SUBMARINE SEAWOLF
STERN DIVING PLANE
STAND

Fig. 25

3. Locate and cement stern diving planes to stern of hull.

4. Locate and cement propellers to stern diving planes.

5. Locate and cement front section of superstructure to rear section of superstructure. Submariners refer to the superstructure as the "sail."

6. Cement periscope and masts section to superstructure.

7. Locate and cement rear section of superstructure assembly to top of hull.

8. Locate and cement missile tank halves together.

9. Locate and cement missile tank to hull.

10. Locate and cement strut to base of guided missile firing stand.

11. Locate and cement missile platform to strut.

12. Locate and cement missile to platform.

13. Cut out sections of decals to correspond with markings as indicated in sketch and then apply.

14. The completed submarine may either rest on the stand or be cemented to it.

The *Seawolf* makes an effective display piece for an aquarium. Use modeling clay in the nose to suspend it in a diving position beneath the surface of the water.

The Confederate Raider on Horse

Figurines, such as the Confederate Raider on Horse, shown in Photograph H and in Figure 26, make excellent bookends and lamp bases. See Chapter 6. You will note from reading the following instructions that the model is assembled in three parts and that the "numbered-part" instruction sheet is used:

A. ASSEMBLY OF HORSE

1. Cement inner half of the left front leg (1LF) to outer half of left leg on left body half (1L). Hold firmly with both hands for at least one minute to allow cement to set.

2. Cement inner half of left hind leg (1LR) to outer half of left hind leg and hold firmly until cement has had time to set.

3. Repeat same procedure for cementing right inner front (1RF) and hind legs (1RR) to right body half.

4. Cement left and right body halves (1L and 1R) to-

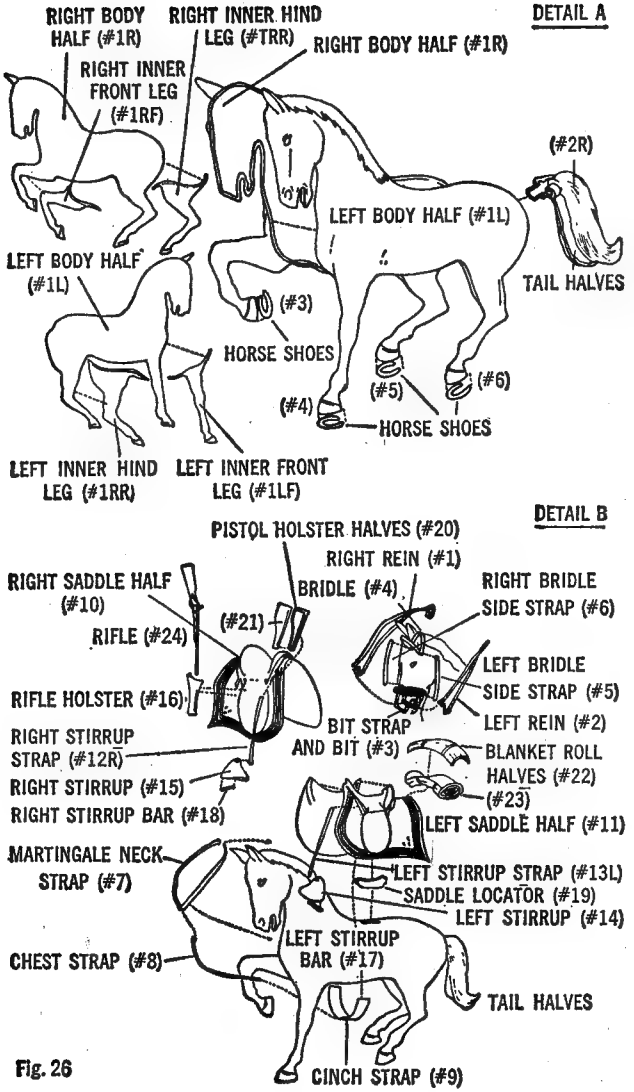

DETAIL A
RIGHT BODY HALF (#1R)
RIGHT INNER HIND LEG (#TRR)
RIGHT BODY HALF (#1R)
RIGHT INNER FRONT LEG (#1RF)
(#2R)
LEFT BODY HALF (#1L)
LEFT BODY HALF (#1L)
TAIL HALVES
(#3)
HORSE SHOES
(#6)
(#5)
(#4)
HORSE SHOES
LEFT INNER HIND LEG (#1RR)
LEFT INNER FRONT LEG (#1LF)
DETAIL B
PISTOL HOLSTER HALVES (#20)
RIGHT REIN (#1)
RIGHT SADDLE HALF (#10)
BRIDLE (#4)
RIGHT BRIDLE SIDE STRAP (#6)
(#21)
RIFLE (#24)
LEFT BRIDLE SIDE STRAP (#5)
RIFLE HOLSTER (#16)
LEFT REIN (#2)
BIT STRAP AND BIT (#3)
RIGHT STIRRUP STRAP (#12R)
BLANKET ROLL HALVES (#22) (#23)
RIGHT STIRRUP (#15)
RIGHT STIRRUP BAR (#18)
LEFT SADDLE HALF (#11)
MARTINGALE NECK STRAP (#7)
LEFT STIRRUP STRAP (#13L)
SADDLE LOCATOR (#19)
LEFT STIRRUP (#14)
LEFT STIRRUP BAR (#17)
CHEST STRAP (#8)
TAIL HALVES
CINCH STRAP (#9)

Fig. 26

DETAIL C

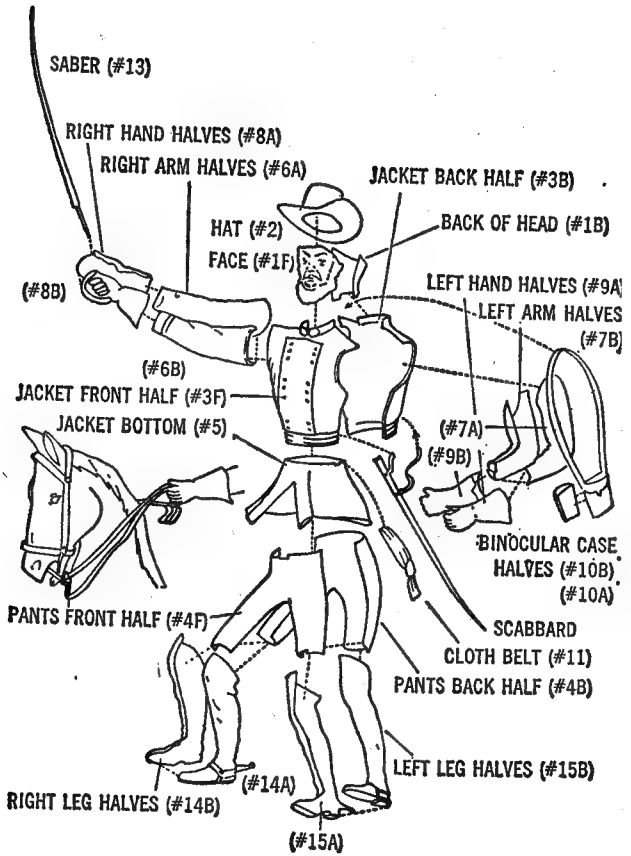


Fig. 26

gether and hold firmly together with both hands for about two minutes to allow cement to set.

5. Locate and cement horseshoes (3, 4, 5, and 6) to hoofs.

6. Cement halves of tail together (2L and 2R).

7. Locate and cement tail to body. Set aside to dry.

B. ASSEMBLY OF SADDLE AND ACCESSORIES TO HORSE

1. Cement saddle locator (19) to back of horse with low side of locator toward front.

2. Cement left and right saddle halves (10 and 11) to back of horse.

3. Cement cinch strap (9) to horse and saddle.

4. Slip bit strap with bit (3) over horse's nose and place bit in mouth.

5. Slip bridle (4) over ears and onto head of horse.

6. Cement left and right bridle side straps (5 and 6) to bridle and bit.

7. Cement martingale neck strap (7) around horse's neck.

8. Cement chest strap (8) to neck strap and cinch strap.

9. Cement stirrup bars (17 and 18) to left and right stirrups (14 and 15).

10. Insert, but do not cement, left stirrup strap (13L) into hole in left stirrup (14).

11. Cement top of left stirrup strap to left side of saddle.

12. Insert, but do not cement, right stirrup strap (12R) into hole in right stirrup (15).

13. Cement top of right stirrup strap to right side of saddle.

14. Cement rifle holster (16) to right side of saddle.

15. Cement pistol holster halves together (20 to 21).

16. Cement pistol holster to right side of saddle.

C. ASSEMBLY OF FIGURE AND ACCESSORIES

1. Cement left leg halves together (15A to 15B).

2. Cement right leg halves together (14A to 14B).

3. Cement front and back halves of pants together (4F to 4B).

4. Cement jacket bottom (5) to pants.

5. Cement front and back halves of jacket together (3F to 3B).

6. Cement jacket to pants and set aside to dry.
7. Cement inner and outer halves of left arm together (7A to 7B).
8. Cement left hand halves together (9A to 9B).
9. Cement left hand to left arm.
10. Cement inner and outer halves of right arm together (6A to 6B).
11. Cement right hand halves together (8A to 8B).
12. Cement right hand to right arm.
13. Cement left and right legs to pants.
14. Cement left and right arms to jacket.
15. Cement ends of cloth belt (11) to slot on left hip. Set aside to dry.
16. Cement binocular case halves together (10A to 10B).
17. Slip binocular case under left arm and binocular strap over right shoulder.
18. Cement face to back of head (1F to 1B).
19. Cement head to body.
20. Cement hat (2) to head.
21. Cement scabbard to left side of body.
22. Place figure firmly in saddle and locate feet in stirrups.
23. Cement left rein (2, Detail B) to bridle bit and to top of right hand.
24. Cement right rein (1, Detail B) to bridle bit and to bottom of right hand.
25. Cement saber (13) to left hand.
26. Place rifle in rifle holster.
27. Cement blanket roll halves together (22 to 23, Detail B).
28. Cement blanket roll to back end of saddle blanket.

The Cunningham Sports Car

The sports car craze has spread across the United States. The Mercedes-Benz, MG, Austin-Healy, Jaguar, Triumph, Ferrari, and the Maserati are only a few of the cars available in model forms. The Cunningham was the first major all-American sports car produced for modern racing. It has become one of the leading contenders in the major road races

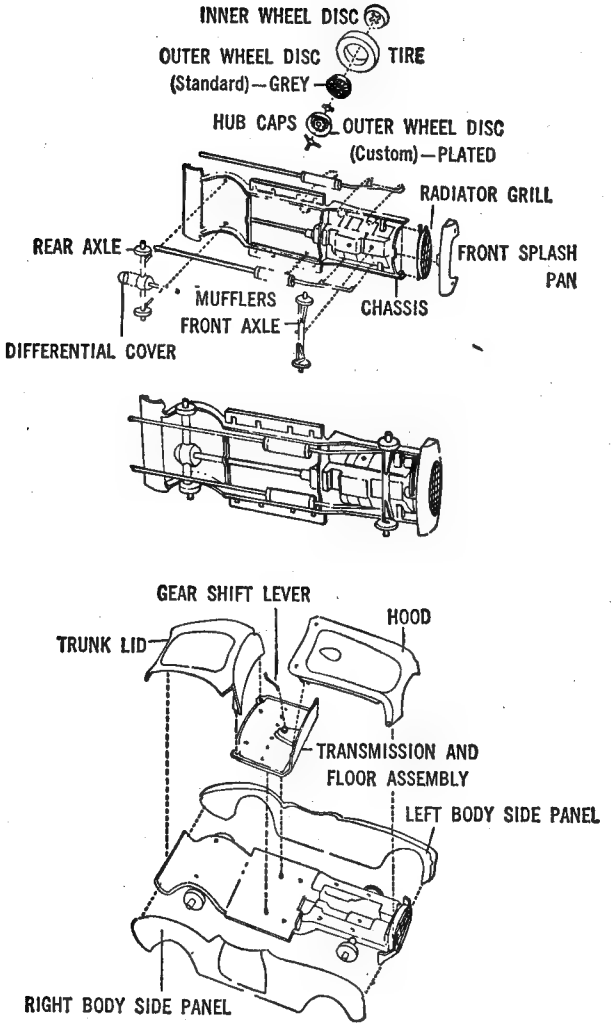
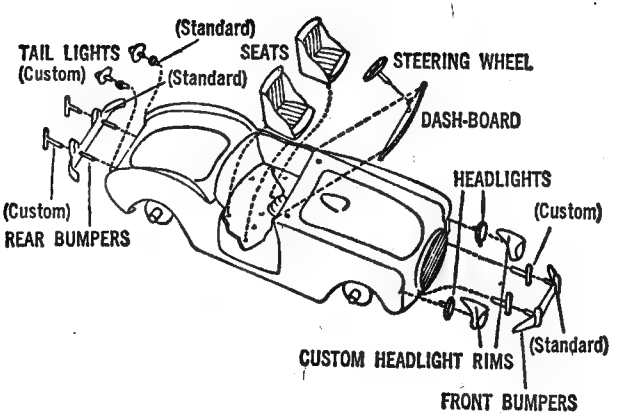

INNER WHEEL DISC
OUTER WHEEL DISC
TIRE
(Standard)—GREY
HUB CAPS
OUTER WHEEL DISC
(Custom)—PLATED
RADIATOR GRILL
REAR AXLE
FRONT SPLASH PAN
MUFFLERS
CHASSIS
FRONT AXLE
DIFFERENTIAL COVER
GEAR SHIFT LEVER
HOOD
TRUNK LID
TRANSMISSION AND FLOOR ASSEMBLY
LEFT BODY SIDE PANEL
RIGHT BODY SIDE PANEL

Fig. 27


(Standard)
TAIL LIGHTS
(Custom)
(Standard)
SEATS
STEERING WHEEL
DASH-BOARD
HEADLIGHTS
(Custom)
(Custom)
REAR BUMPERS
(Standard)
CUSTOM HEADLIGHT RIMS
FRONT BUMPERS

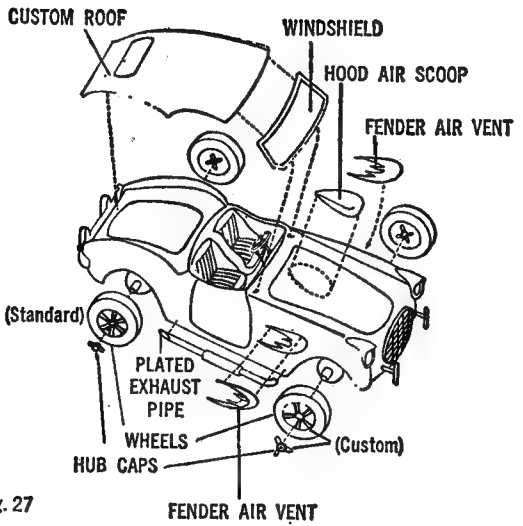

CUSTOM ROOF
WINDSHIELD
HOOD AIR SCOOP
FENDER AIR VENT
(Standard)
PLATED
EXHAUST
PIPE
WHEELS
HUB CAPS
(Custom)
FENDER AIR VENT

Fig. 27

in America and Europe. As you will note in Figure 27, the car has two styles—standard and custom. The instructions for the Cunningham will give you practice in reading drawings designed for two different models. See how you would assemble a standard model; then note assembly for a custom model. The custom parts are plated, while the standard parts are of grey plastic.

1. Apply cement to outside edge of the raised rim (not in hole) of an outer wheel disc, grey (standard) or plated (custom). Insert it into a tire and press on an inner wheel disc from the opposite side.
2. Cement differential cover to rear axle.
3. Cement rear axle to underside of chassis.
4. Cement front axle to underside of chassis.
5. Cement mufflers to underside of chassis.
6. Cement radiator grill to front end of chassis.
7. Cement front splash pan to underside of radiator grill and chassis.
8. Cement transmission and floor assembly to floor of chassis.
9. Cement gear shift lever to transmission.
10. Cement hood to chassis.
11. Cement trunk lid to chassis.
12. Cement left and right body panels to chassis.
13. Cement dash-board to body.
14. Cement steering wheel to dash-board.
15. Cement seats to floor of body.
16. Cement headlights to front fenders.
17. Cement left and right, plated (custom), headlight rims to headlights.
18. Cement left and right tail lights—grey (standard) or plated (custom)—to rear fenders.
19. Cement front and rear bumpers—grey (standard) or plated (custom)—to body.
20. Snap wheels onto axles.
21. Cement hub caps—grey (standard) or plated (custom)—to wheels.
22. Cement plated (custom) hood air scoop to hood.
23. Cement plated (custom) fender air vents to front fenders.

24. Cement windshield to body.
25. Cement custom roof to body.
26. Cement plated (custom) exhaust pipe to right side of body.
27. Apply customizing decals as desired.

The 1920 Monroe Special Racer

Models of auto racers—especially the older ones—have a place in every man's den and every boy's room. The racer illustrated in Figure 28 is the Monroe, the first small American-built auto to win the Indianapolis Speedway "500." It was designed and built by Louis Chevrolet, the pioneer racing driver, and the winning average speed was 88.16 miles per hour in 1920. Here are the manufacturer's step-by-step instructions for assembling the Monroe:

1. Cement instrument panel to inside of left body half.
2. Cement body halves together.
3. Cement radiator to front of body.
4. Cement radiator grill to front of body.
5. Cement seat to inside of body.
6. Cement left and right rear frame extensions to body.
7. Cement rear cross bar between rear frame extensions and body.
8. Insert rear axle into holes in rear frame extensions and body.
9. Cement left and right rear springs to the rear frame extensions and rear axle.
10. Cement left and right front frame extensions to body.
11. Cement front "T" cross bar between front frame extensions and to hole in bottom of radiator grill.
12. Cement left and right front springs to front frame extensions.
13. Cement front axle to front springs.
14. Cement rear (large) brake drums to rear axle.
15. Cement left front brake drum (with two small holes) to left side of front axle.
16. Cement right front brake drum (with one small hole) to right side of front axle.
17. Cement tie rod to holes near bottom of front brake

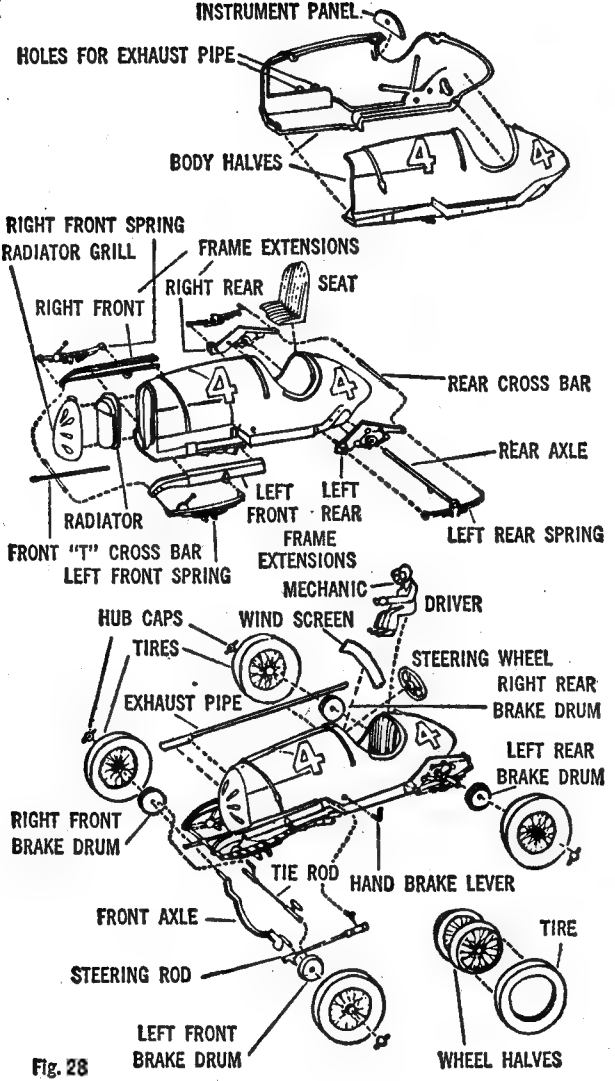

INSTRUMENT PANEL
HOLES FOR EXHAUST PIPE
BODY HALVES
RIGHT FRONT SPRING
RADIATOR GRILL
FRAME EXTENSIONS
RIGHT REAR
SEAT
RIGHT FRONT
REAR CROSS BAR
REAR AXLE
RADIATOR
LEFT FRONT
LEFT REAR
FRAME EXTENSIONS
LEFT REAR SPRING
FRONT "T" CROSS BAR
LEFT FRONT SPRING
MECHANIC
DRIVER
HUB CAPS
WIND SCREEN
TIRES
STEERING WHEEL
RIGHT REAR
BRAKE DRUM
EXHAUST PIPE
LEFT REAR
BRAKE DRUM
RIGHT FRONT
BRAKE DRUM
TIE ROD
HAND BRAKE LEVER
FRONT AXLE
TIRE
STEERING ROD
LEFT FRONT
BRAKE DRUM
WHEEL HALVES

Fig. 28

drum.

18. Cement steering rod to hole near top of left front brake drum and to hole in left side of body.

19. Cement hand brake lever to left side of body.

20. Cement exhaust pipe to right side of body.

21. Cement driver and mechanic to seat.

22. Cement steering wheel to instrument panel.

23. Cement wind screen to left side of body.

24. Locate 2 matching wheel halves together and mount tires on wheels. It is not necessary to cement wheel halves together.

25. Mount wheels on axles. Then apply cement to inside of hub caps. Avoid using too much cement so that wheels may turn freely. Only the hub caps are cemented to the axles.

You will note that in the instructions detailed in this chapter no mention was made of decorating the models. As a rule, painting is left to the modeler.

The manufacturer may make detailed suggestions, but he seldom incorporates them directly into the assembly directions. In the next chapter, we will cover detail decorating and will discuss giving these eleven models further realism and authenticity. The next chapter also deals with the application of decals, an important element in any model assembly.

5

THE TECHNIQUES OF DECORATION

While the parts of some kits are molded in two, three, or more colors, the majority come in only one. For example, all the parts of most modern aircraft are molded in a silvery aluminum color. These—plus decals and clear plastic parts —combine to produce a colorful finished model. If you wish to decorate the model further by painting, the picture on the cover of the box in which it was packed may be used as a guide to color selection and the areas to be painted. Books and magazines may also be consulted for authentic colors. However, in many cases, the manufacturer gives a suggested detail painting scheme. It is a good idea to follow these painting suggestions for they will save you a great deal of research time, and will assure you of color schemes that are authentic.

With plastic models, use only those paints which are specified for use on plastic surfaces. (Many paints, such as the common model airplane dopes, have a tendency to soften plastic—an effect that is desirable in cements but not in paint.) These special plastic paints cover in one coat, leave no brush marks, and dry in approximately thirty minutes. Plastic paints and enamels are available at most hobby shops, toy dealers, or variety stores.

Detail painting is an important job frequently overlooked by kit builders. Meticulous, accurate painting means the difference between an average model and an authentic replica of the prototype. For instance, the model of the Spad XIII shown in Figure 35, page 86, is molded in an olive drab. The propeller, propeller shaft, machine guns, exhaust manifolds, wheels, fuel line, and tail skid are molded in

black plastic. While the two molded colors, finished with decals, will make an attractive model, realism and authenticity can only be created by detail painting.

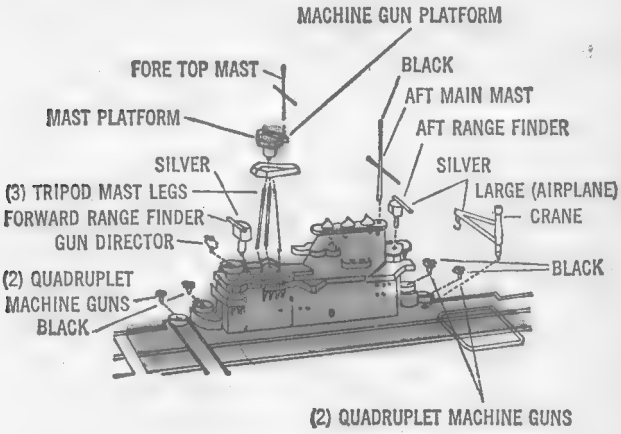


Fig. 29

If you intend to paint your model to provide additional realism, we recommend that you examine fully all the steps in the instruction sheet for pieces requiring decoration. To help you locate the parts that should be painted, some manufacturers make special notation of the suggested color scheme, as shown in Figure 29. Small parts such as machine guns, landing gear, pilot figurines, propellers, and other miscellaneous items should be painted before they are removed from the plastic trees or runners.

Tweezers will help you to hold tiny parts while you are painting them. But when painting parts prior to assembly, make certain whenever possible to avoid getting paint on areas that will be cemented. After the parts have been painted and given sufficient time to dry, they may be cemented in place as described in Chapter 3. Be extremely careful during the cementing operation not to damage the

painted surfaces. However, should any scratches or damage occur, touch them up with a fine brush and the proper color after the assembly work has been completed.

In the case of the Spad XIII (Figure 35, page 86), the propeller, cabane and interplane struts, landing gear struts, and tail skid should be painted brown; the radiator and wheel centers should be done in silver; the padding around the cockpit and pilot's seat, in black; and the auxiliary plane and the undersides of the wings and elevators, in buff or cream. All this painting should be done while the parts are on their trees or before assembling them. Be certain to allow enough time for the paint or enamel to dry thoroughly before handling these parts. After the assembling has been completed, the underside of the fuselage can be painted buff. At this time, you can do such detailing as outlining the vents and other molded fuselage parts in black and creating the effect of depth in the cockpit by using a mottled finish of black, grey, or brown.

A small pointed Number 1 artist's brush is best for details, while a brush about 1/4 inch wide can be used for larger areas. Buy the best brushes possible; they last ages if cared for properly, and will improve with use. When painting with a brush, be sure there is sufficient paint, but not enough to cause dripping. You should touch the model's surface with the tip of the brush only. The end of a toothpick or opened paper clip can be used for minute detailing, such as nuts, rivet heads, and very small parts.

When painting an assembled model, it is advisable to wait at least 24 hours to allow the cement sufficient drying time. This will prevent "crinkling" or "lifting" of the paint. Wherever a dull finish is desired, apply flat coat, a special paint available at most model dealers for this purpose. It may be applied directly to the plastic or to any *dry* painted surface.

While most figures, letters, numbers, and insignias are furnished with the kits in the form of decals, some builders prefer to paint them as they are outlined in the plastic. Insignias and letters or numbers may be painted by using a small brush with all but 8 or 10 hairs removed. Masking or cellulose tape may be used to cover any areas

where paint is not desired. When simple paint decoration calls for masking in straight lines on wings and tail parts of airplanes, use wide rubber bands.

To add realism to World War I airplanes, camouflaging is also a must. The French applied the camouflage on their aircraft in a hodgepodge manner using dark green, light tan, and medium green (Figure 30), while the British were partial to olive drab with buff or cream on the undersides of the fuselage, wing, and tail surfaces. In the German squadron you will find a countless variety of color possibilities, with red predominating. While many German planes were entirely camouflaged, others were disguised only on their fuselages or wing sections. The German camouflage usually consisted of factory-made standard polygon shapes or field-made lozenge-shaped patches of sage, green, bluish mauve, reddish mauve, blue, black, tan, violet, and grey. As in all camouflaging work, only flat, dull colors were used, to minimize reflection.

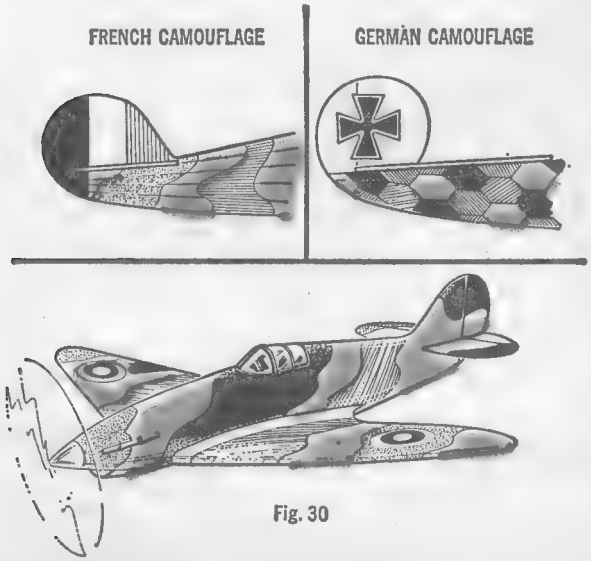


Fig. 30

In addition to World War I planes, some World War II aircraft (Figure 30, bottom panel, the British Spitfire—blue, chocolate brown, olive drab, and green), tanks, and battleships may be camouflaged for realism. Examples of camouflaging may be found in books on World Wars I and II at your library and in such publications as *Air Progress, American Modeler, Flying, Flying Models,* and *Model Airplane News.* Two examples of camouflage coloring can be found in Photograph J. Note the lozenge camouflage on the Fokker D-8.

Military airplanes in the years between the two World Wars were painted in the most elaborate manner. On the top wing surface of the Boeing F4B-4, a broad red chevron was added as a visual aid to assist formation flying in three-plane flights—the standard flight pattern of that era. Each flight leader had two wingmen who took positions above and behind his plane, generally in line with the angles of the flight leader's chevron. Because of the fuselage on low-wing monoplanes of that period, the chevron could not be brought to a V. The stripes began just outboard of the wing walk or root and angled back to the trailing edge.

In addition to this colorful touch, the airplane's cowling color identified its position in the squadron. (The squadron usually contained eighteen airplanes, but each group of three had its own leader.) Only the squadron commander's and the flight leaders' planes had fully painted engine cowlings. The cowling of the squadron commander's plane was red; the flight leader's plane in the fourth position of the squadron was white; the flight leader's plane in seventh position was blue; the leader's plane in the tenth position was black; the leader's plane Number 13 was green; and the leader's plane Number 16 was yellow.

The other planes in the squadron were painted either on the upper or lower halves. Plane Number 2 was red on the top, plane Number 3 was red on the bottom; Number 5 had the top half of its cowling painted white, etc. A fuselage band of the same color as the cowling was reserved for commanders and leaders.

In the case of carrier-based planes such as the Curtiss SBC-3, the color of the tail section identified the name of

the carrier—the U.S.S. *Lexington,* lemon-yellow; the U.S.S. *Yorktown,* red; the U.S.S. *Ranger,* willow-green; the U.S.S. *Saratoga,* white; and the U.S.S. *Enterprise,* blue. Since the coloration of all military aircraft of the period of 1918 to 1940 is important for complete realism, it is suggested that you check the flying publications mentioned on page 76 for further information. This elaborate coloring has been eliminated in most cases from the aircraft of today.

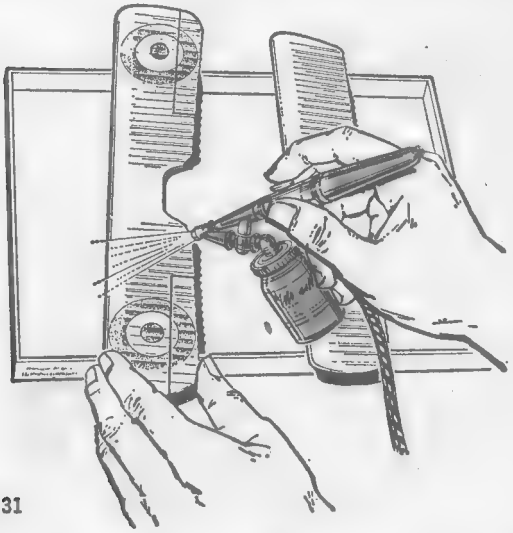


Fig. 31

To apply camouflage and various other decorative effects, an airbrush is very handy. The simple, inexpensive type shown in Figure 31 will do a good job both free-hand or within masked areas. (Fumes from plastic paints or enamels that are sprayed are unhealthy and any such work should be done in a well ventilated area.) Camouflaging can be done by hand painting, of course, and when properly detailed, will greatly enhance the beauty of the finished model.

As you will see later in this chapter, detail painting may sometimes require several colors and shades. Fortunately,

most plastic kit dealers have a large selection of plastic paint and enamel colors available. And they are inexpensive —about ten cents a bottle. Also, with just three colors—red, yellow, and blue—you can mix four others; orange, purple, green, and brown (see Photograph P). Adding a little white to any color will give a lighter shade of that color; adding black will give a darker shade. Gray can be obtained by mixing black and white. Thus, a little experimenting with black and white and the three basic colors, will give you ten colors and many variations of tones with which to decorate your models. One word of caution—never mix paints or enamels of different manufacturers. Their formulas may not be the same, and they may not blend properly. The manufacturer's instructions, usually found on the container, should be carefully followed.

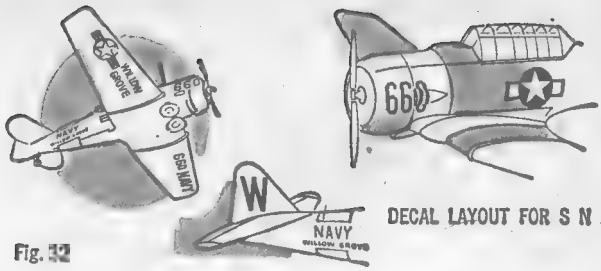
A thinner is available for most plastic paints and enamels; it can be used to thin colors or to clean brushes. A brush should always be cleaned with thinner after each color is used. When spraying plastic paint with an airbrush, mix half of the thinner with half of the paint, and pour the mixture into the airbrush container. The airbrush can be cleaned by using thinner.

Lids of paint or enamel bottles can be loosened by inverting the container and applying the thinner along the edge of the cap with an eye dropper. Wait for it to soften the dried paint or enamel before opening the lid. Do not use the plastic paint thinner, however, to thin flat coat or to clean a brush used with flat coat. Instead, use ordinary household alcohol.

APPLYING DECALS

To make your finishing task easier, most figures, designs, letters, numbers, and insignias are provided with the kit in the form of decals. See Figure 3, page 18. They give the model an authentic look without the necessity of hand painting. Some models, such as the "Butterflies-of-the-World" series (Figure 2, page 16), depend entirely on decals for their colorful decoration.

The decals are usually furnished on one sheet of paper,



DECAL LAYOUT FOR S N J

Fig. 32

and each design must be cut from the sheet separately along the lines indicated. Be careful to trim as close to the color outline as possible. Work with one design or figure at a time.

While most decal instructions suggest dipping the individual design in water, we have found that for better adhesion to the plastic, it is a good idea to add about six drops of liquid detergent to a glass of water. The decal will loosen more easily if warm water is used. With your finger or a rag, rub the solution onto the surface where the decal is to be applied. After the surface has been thoroughly cleaned, dip the decal design into the detergent-water solution for about five seconds. *Do not soak.* Wait about thirty to forty seconds before testing to see if the decal film moves easily. If it does not, dip it into the solution for a few more seconds and retest. When it slides easily on the paper, shake off any excess solution and apply as follows.

Study the model's instruction sheet and working drawings (Figure 32 illustrates a typical layout detail), or look for the design's outline in the plastic for the correct location.

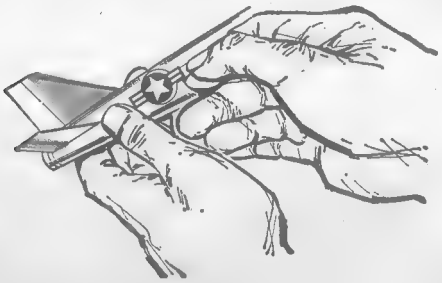


Fig. 33

Then slide the decal partly off the paper backing, holding it in its correct place on the model (Figure 33). The decal can be shifted into the correct position on the model after lifting it and applying a little water around the edges with your finger. When the decal design is in the proper position, press out the air bubbles and blot with a clean damp rag. Allow the decal sufficient time to dry—about half an hour—before any further handling of the model. Do not become alarmed if the decal appears milky against the colored plastic background. This will disappear when the decal is thoroughly dry.

A new type of decal has been recently introduced, the "pressure-sensitive" decal, and a few manufacturers are now offering it with their kits. With this type, you carefully cut out the design—a neat and accurate job is essential—remove the paper backing with your fingers, and press the decal into place in its proper position. After it has been pressed down firmly, it will adhere perfectly. Since it was applied without water, there is no drying time necessary.

Any decals applied to a curved surface, such as the fuselage of an airplane or the fender of a car, may wrinkle along the edges. To eliminate wrinkles, slit the decal very carefully with a razor blade where the wrinkle occurs and press down.

After decals have dried for a day or two, you can, if you wish, brush on a very light coat of clear spar varnish. While the varnish usually takes a couple of days to dry, it will give the decals indefinite protection. If an old, untreated decal should begin to peel off, it can be tacked down with a little polystyrene cement.

RIGGING A SAILING SHIP MODEL

The proper rigging of such sailing models as the *Corsair,* the schooner *Blue Nose,* the *Black Falcon,* and the *Cutty Sark* is much like the frosting on a cake. It is the final touch which makes the model complete.

Rigging is a comprehensive word for all the rope work on a sailing ship—the sails, spars, and masts. As far as model assemblying is concerned, rigging may be divided into two

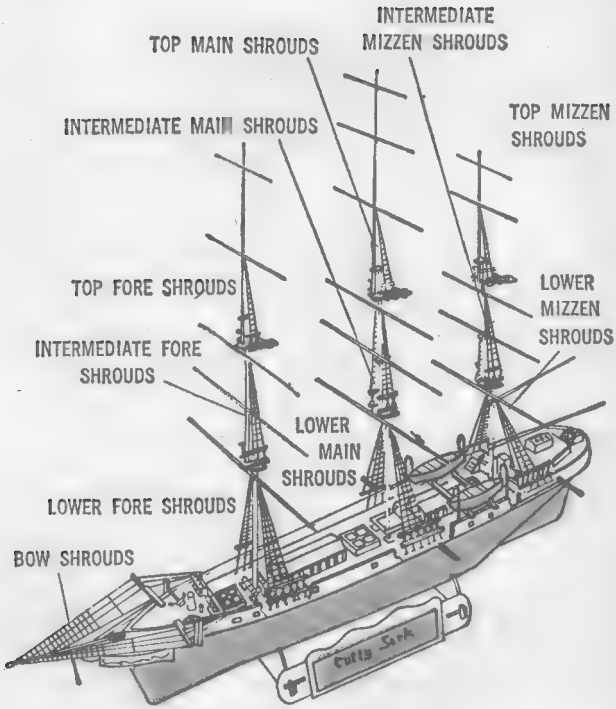


Fig. 34

classes: *standing rigging*, which supports and stays the masts; and *running rigging*, which controls the yards and sails.

Let us look first at the basic elements of the standing rigging, which consists of such items as the shrouds, stays, backstays, and ratlines. The shrouds and the backstays support the masts from the crosstrees and sides of the ship, while the stays support the masts in a fore-and-aft direction. The ratlines form a rope ladder in the shrouds. They are used by the crew for climbing aloft. (In many sailing

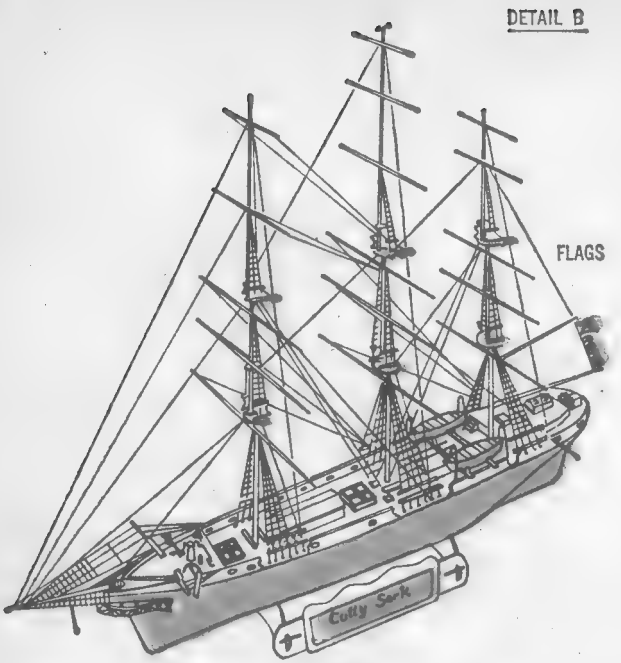


Fig. 34

kits most of the shrouds and ratlines are of molded plastic and are cemented in place in the same manner as other parts. This eliminates the most difficult procedures of rigging a boat.) The standing rigging is tarred and is represented on models with black thread of about Number 40 weight, or with light-weight or low-test black nylon fishline. It is a good idea to keep the thread or line—"cordage" is the term used by riggers—on the light side. It is far better to err in this direction than to overload your sailing model with heavier line.

The running rigging, which is light in color (usually Number 36 white or tan thread), includes the sheets, halyards, braces, and lifts. These are all lines that pass through blocks; they are used to move spars and sails. The sheets

control the lower corner of a sail or after end of the boom; the halyards raise and lower sails or yards; the braces swing the yards and control their position; and the lifts support and control the angle of a boom or yard. The various running rigging lines extend from their individual parts aloft, through blocks or sheaves, and down to the deck of the ship. They are fastened at the pin rails in the bulwarks or at the fife rails around the mast base. Blocks in the running rigging may be simulated by making heavy knots and coating them with model airplane dope or polystyrene cement.

To preserve the life of the thread, draw all your rigging lines or cordage once or twice through a lump of beeswax before they are installed. Rigging line or thread should be well stretched before use to avoid sagging on the model.

Rigging is usually best started with the shrouds and should progress from the bow toward the stern. This procedure follows good nautical tradition. In the model of the *Cutty Sark,* shown in Figure 34, the bow shrouds are installed first, followed by the foremast shrouds, the mainmast shrouds, and finally the mizzenmast shrouds. In the illustrated model of the *Cutty Sark,* the shrouds are of plastic and are cemented in place as in the following manufacturer's instructions:

1. Cement left (port) and right (starboard) bow shrouds to bowsprit and hull railing at bow section.

2. Cement bow shroud booms (2) to bow section of deck and to port and starboard bow shrouds. See Figure 23, pages 52-53.

3. Cement port and starboard lower fore shrouds to foremast and forward section of deck.

4. Cement port and starboard intermediate fore shrouds to foremast and mast platform.

5. Cement port and starboard top fore shrouds to foremast and crosstree.

6. Repeat same procedure for cementing shrouds to main and mizzenmasts.

After cementing the masts in place, allow at least four hours of hardening time to elapse before attempting any rigging operations. Start the cordage rigging by running the

lashing between the bowsprit and the foremast. After the bowsprit is rigged, the foremast, mainmast, and mizzenmast, in that order, can be rigged. This includes all the remaining standing rigging. Care should be taken when fastening the rigging to the masts to avoid pulling the masts out of alignment or causing an imbalance in the tension of the rigging. So interconnected is the rigging of a sailing ship that too much or too little pull anywhere is bound to produce an overtightening or sagging somewhere else; this particularly applies when standing ends of halyards or braces are made fast to stays.

If any of your knots tend to slip, coat them with a speck of cement applied with a pin. Use a long thread so that you can tie the knots properly; then cut off the excess. A crochet needle or a needle threader will be useful in weaving your rigging about the masts.

After the standing rigging has been installed, the lighter running rigging can be set in its proper locations. (In the example of the *Cutty Sark*, illustrated in Figure 34, Detail B, the only running rigging shown is that needed to handle the spars or yardarms.) If your model has sails, however, it is generally best to install them before applying the running rigging to the model.

Do not overload your model with rigging. As a rule, most sailing models are built with the standing rigging fairly complete, but with the running rigging including only what is needed to handle the yardarms or spars and the major sail components. It is a good idea to leave out everything which would not show when the model is viewed from a distance of a foot or two. A real ship, when seen from the comparable distance of half a mile, would reveal only its main rigging.

Many plastic models are outfitted as the ship would appear in port, with sails stowed. A few models, however, are available with a full set of sails. These realistic sails of plastic usually come in a sheet and must be carefully trimmed. For purposes of illustration, let us look at Photograph C. This picture shows the correct order of installing the sails for the American privateer, *Corsair*. Here are the manufacturer's instructions:

1. Start by installing the mainsail Number 1. The forward edge is tied to the mast. The two other ends are tied to the gaff and boom. A small amount of plastic cement can be used where the sails join the mast, boom, and gaff. The boom should be cemented to the mast and held to the left center till the cement sets.

2. Sail Number 2 is tied and cemented to the mast and gaff. The free end is tied to the port rail.

3. Sail Number 3 is tied to the main yardarm. Leave enough excess thread so you can tie the bottom of sail Number 2 in the same spot. The bottom of sail Number 3 is tied to the rear mast shroud lines at the gunwale.

4. Sails Number 4, 5, 6, and 7 are all tied at their four corners to the yardarms as shown on the diagram. Tie the top edges first and then the lower corners.

5. Sail Number 8 is tied to the yardarm at the top and to the rear trestletree at the bottom. Rig two lines between the rear trestletree and the tips of Number 4 sail yardarm to make the sail billow. The sail will rest on these lines which will hold the bottom out.

6. Sails Number 9 and 10 are tied to the bowsprit first at their front lower corners. The tops are tied to the mast at the top trestletree. The free end can then be tied to the port shrouds. Instead of thread, soft wire can be used to hold them in flying position.

7. Additional riggings can be installed if desired as shown in the photograph. These lines run from the tips of sail Number 6 to the rear mast below sail Number 7, from the tips of sail Number 8 to the front mast below sail Number 6, and from the tips of sail Number 5 to the rear mast below sail Number 7.

8. Run double lines from each tip of sail Number 3 to the inside of the gunwale near the tiller and cement in place.

While the foregoing was specifically for the *Corsair,* it is basic procedure for outfitting most sailing vessels. Sail installation techniques will vary somewhat according to the ship type.

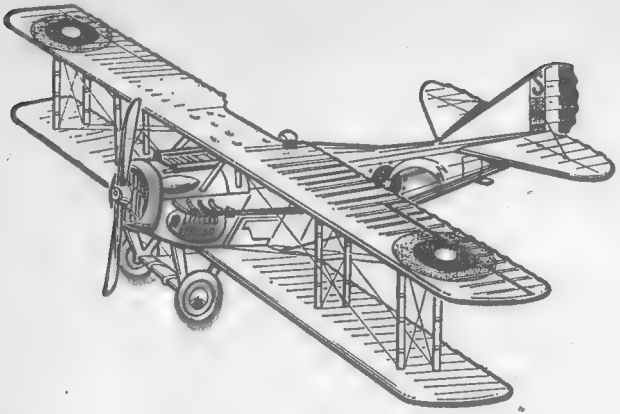


Fig. 35

OTHER MODEL DECORATING TIPS

Care in handling the smallest details will enhance the beauty and authenticity of a model. The addition of the brace wires and flying rigging to the Spad XIII, shown in Figure 35, gives the airplane the appearance it had when it was flying the skies over France in World War I. Thin black thread, held in place by a small drop of cement, can be used to simulate the wire.

Following are suggestions for detailing on the models discussed in the last chapter. You will find that the additional effort required will pay handsome dividends in the appearance of your finished models.

The P-38 Lockheed Lightning

This fighter plane (Figure 18, page 33) is molded in olive drab; it can be given additional realism by the following paint detail scheme:

Black • Seat back
Instrument panel

		Tires
		Pitot tube
		Engine details
Dull Black	•	Anti-glare panel on pod in front of pilot
Red	•	Hubs of propellers
Silver	•	Wheel center
		Turbo supercharger
		Mass balances
		Instruments
		Landing gear struts
Brown	•	Pilot's suit and helmet
Flesh	•	Pilot's face
Mottled Grey and Brown	•	Cockpit interior

This decorative schedule, most of which should be done before assembly, and the decals, added after assembly, give you a realistic model of the same plane that fought so valiantly during World War II.

The Fokker DR-1 Triplane

The suggested color scheme for the DR-1 (Figure 19, page 37), if piloted by Baron von Richthofen, is red—the molded color—except for the tires, engine, machine guns, and cockpit interior which should be black. Of course, if you wish, the triplane may be camouflaged, using the German system described earlier in this chapter. The ground panel should be green with black chocks. The only wire supports on the triplane are an "X" across the cabane struts, an "X" across the landing gear, and single wires on the upper and lower tail brace. The insignia of this plane is straight-sided black crosses outlined by a thin white band.

The Chance Vought F8U-1 "Crusader"

The suggested painting scheme for the F8U-1 Crusader (Figure 20, page 40)—the basic color of the parts is silver-grey—is as follows:

Black	•	Radar nose
		Inside of jet intakes
		Tires
		Seat back
		De-icer boots
		Jet engine details
		Outline around canopy
		Pilot's boots
Mottled Dark Grey	•	Cockpit interior
Flat Black	•	Anti-glare panel
Silver	•	Landing gear struts
		Wheel centers
		Jet engine (base)
		Instruments
Tan	•	Pilot's suit
Flesh	•	Pilot's face
White	•	Helmet

The Kaman Hok-1 Helicopter

Little is required to give this helicopter (Figure 21, page 43) full authenticity. Since all the parts are molded in olive drab, the only detail painting suggestions are as follows:

Silver	•	Rotor heads
		Landing gear struts
		Wheel centers
		Instruments
Mottled Dark Brown	•	Interior of helicopter
Black	•	Tires
		Control stick panel
		Instrument panel
Yellow	•	Blade tips

The M-46 "General Patton" Tank

Since this tank (Figure 22, pages 46-47) is molded olive drab, no further painting is required other than giving the figures flesh-colored faces and brown uniforms. If you wish, you may bring out a few of the tank's details with thin lines

of black paint. The decals will give the "color" to this model.

The Cutty Sark

The complete rigging for this ship (Figure 23, pages 52-53) was detailed earlier in this chapter.

Light Brown	•	Deck
		Masts
		Yardarms
		Platforms
		Crosstrees
		Bowsprit
		Aft railings
Dark Brown	•	Lifeboat seats and rails
		Forward railings
White	•	Cabins
		Lifeboat hulls
		(See Figure 23)
Dark Green	•	Hull above water line
		Lifeboat cradle
Black	•	Pilot's wheel
		Windlass
		Winch
		Stand fife, pin rails
		Anchors
		Hatch frames
		Shrouds and davits
Flesh	•	Figure head
Gold	•	See Figure 23.
Bronze	•	Hull below water line

The U.S.S. Halford

While this destroyer (Figure 24, pages 56-57) is molded in a true Navy grey, it can be given further realism with the following painting scheme:

Yellow	•	Life rafts
		Cover for lifeboat

Navy Blue	•	Airplane
Black	•	Hull below water line
		Anchors and chains
		Mast
		Tin cans
		Gun barrels
		Other small details
Silver	•	Catapult
		Radar screen
		Searchlight front
		Torpedo tubes
		Flagstaffs
		Lifeboat davits
		Airplane propeller
		Airplane canopy

Ship signal flags are available with this kit and can be hung by a black thread from the forward flagstaff to the radar mast to the stern flagstaff.

The S.S.N. Seawolf

There is little work necessary to make this nuclear submarine (Figure 25, page 60) ready for duty.

Black	•	Below water line
Grey	•	Above water line
Silver	•	Periscope masts
		Guided missile platform
Bronze	•	Propellers
White	•	Missile

The Confederate Raider on Horse

Plastic models of figures require more detail painting than other models to make them realistic. The following is the painting scheme for one of the series of "Famous Warriors" (Figure 26, pages 62-63):

Black	•	Horse
		Raider's boots

		Scabbard
		Binocular strap, case
		Rifle barrel
		Raider's belt
		Horseshoes
		Raider's eyes
Light Brown	•	Rifle stock
Brown	•	Martingale
		Chest strap
		Bridle
		Reins
		Saddle
		Stirrups
		Blanket roll straps
		Rifle holster
Light Grey	•	Lower part of horse's legs (black at knee joint)
Dark Grey	•	Horse's hoofs
		Raider's beard
		Eyebrows and hair
Bright Blue	•	Saddle blanket
Blue Grey	•	Raider's uniform
		Hat
		Blanket roll
Bright Yellow	•	Braid on sleeve
		Stripes on pants legs
	•	Cloth belt
		Scabbard straps
		Jacket buttons
		Jacket collar
		Hat band
		Stripes above, below belt
		Stripes on saddle blanket, stars on blanket
White	•	Gloves
		Raider's teeth
		Whites of eyes
Gold	•	Studs on bridle
		Saddle guard
		Stud on martingale

Silver • Saber
Light Red • Raider's mouth
Flesh • Raider's face

The Cunningham Sports Car

There is an increased tendency among hobbyists who assemble sports cars to customize them. As illustrated in Figure 27, pages 66-67, the Cunningham sports car kit has available, at a slight extra cost, such customized chrome parts as headlights, roof, air vent, hub caps, and exhaust pipes. With these, plus decals, you can decorate a standard car (see Photograph D) to appear as shown in Figure 36.

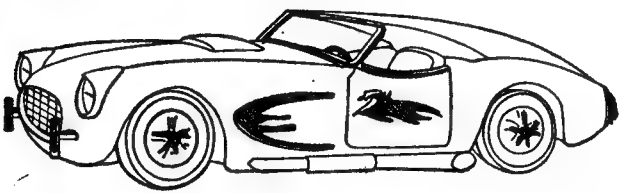


Fig. 36

Silver • Front and rear bumper
Lights
Radiator grill
Wheels
Windshield frame
Tail light rims
Hub caps
Front of air scoop
Dash dial faces, knobs
Gear shift knob
Steering wheel spokes
Black • Exhaust pipes
Floor mat
Steering wheel rim
Gear shift shaft
Dash-board
Textured part of seats

Trim around cockpit
Motor hood
Red • Tail light lenses

If you wish to paint your sports car for racing, use the following international competition colors:

Country	*Body and Chassis*	*Numbers*
Belgium	Yellow	Black
France	Blue	White
Germany	White	Red
Great Britain	Green	White
Italy	Red	White
U.S.A.	White Body, Blue Chassis	Blue on White

The 1920 Monroe Special Racer

The following is the suggested detail painting scheme for the Monroe Special (Figure 28, page 70):

Silver • Wheels
Hub caps
Brake drums
Gas cap
Blue • Body
White • Wind screen
Driver and mechanic helmet
Red • Radiator shell
Black • Seat
Steering wheel
Padding around seat
Hood strap
All other racer parts
Brown • Driver and mechanic suits
Flesh • Faces and hands

6

MAKING USE OF YOUR FINISHED MODELS

What to do with finished models is a question faced by hobbyists as their collections begin to grow. The enthusiast who continues to build—unless he is blessed with more shelf and table space than most of us—will find eventually that he has reached the saturation point in display area.

Following are suggestions for both functional and decorative uses of completed models that will help you to solve this problem. Do not be limited by them; let your imagination run and you will be amazed at the endless variety of ways that will suggest themselves.

HOME DECORATION

Finished plastic models have a place in any home's decorative scheme. The study, the den, the game room, the living room—all can feature attractive models regardless of the decorative period of the room. The long, divided wall shelves, so popular in the modern home, make excellent display areas for plastic models, as do the older breakfronts. In any home of colonial design, the fireplace mantel looks unfinished without a display model of a sailing vessel. The butterflies that are a feature in so many bathroom wallpapers, shower curtains, and window draperies can be given life by plastic model butterflies attached to the wall for a three-dimensional effect. Figure 37 shows how plastic mod-

Fig. 37

els can be used in shelves, as desk ash trays, and as book ends. Let us take a closer look at the ways finished plastic models may be used for specific decorative purposes.

MOBILES. In modern home decoration, mobiles are becoming increasingly popular each year. And what is more modern than the jet mobile shown in Figure 38? It features such famous jets as the F-107A, F-101, F-102, F-104, F9F6, and the X-13 Vertijet. When assembled, the entire unit has a spread of approximately 28 inches and hangs 20 inches deep.

To start the mobile, cut "clouds" in realistic shapes from 1/16 inch thick fiberglass material or extra-heavy, sky-blue construction paper. To give greater realism to the clouds, paint them with streaks of white. Hang them in place with thin wire or heavy black thread. Number 36 or Number 40 thread may be used except for the large clouds which should be hung with fishline or thin wire. The thread can be cemented to the cloud or tied to it through a small hole. Center the cloud carefully so that it will hang without tilting.

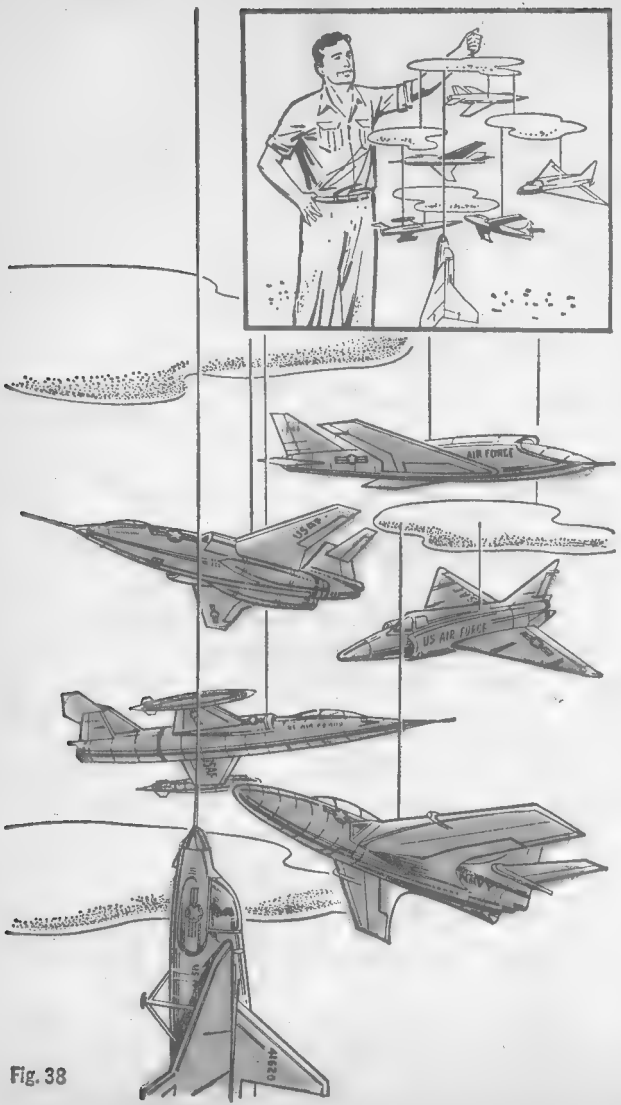
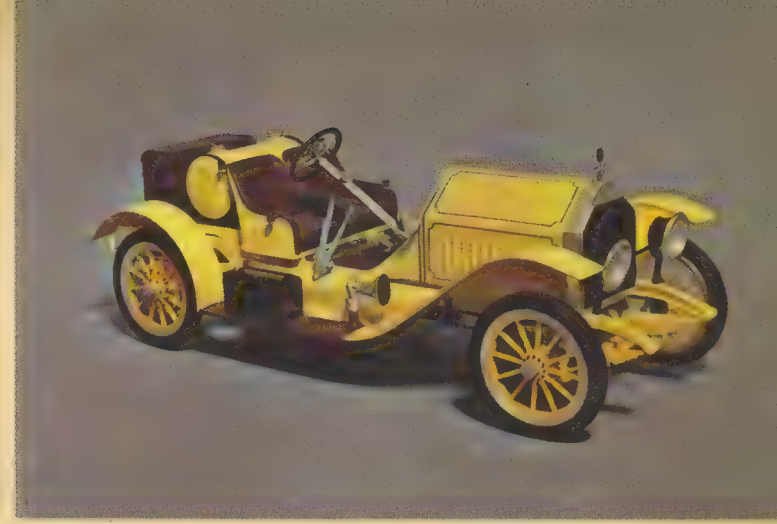


Fig. 38



I. Classics of America's old-time automobiles available in plastic kits: the Stutz Bear Cat (Top) and the Stanley Steamer (Bottom).

J. Examples of camouflage on World War I airplanes: the Fokker D-8 (Top) and the Spad XIII (Bottom). Models of both planes are available in kits.

K. The work horse of the Army Air Force, the Flying Boxcar, carried troops and supplies to every corner of the globe during World War II. To see how this photograph was made, see Photograph X.

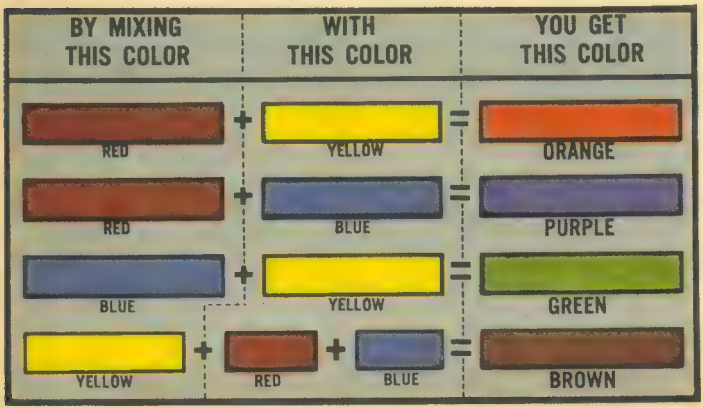
L. The Schooner "Blue Nose" was the pride and joy of sports enthusiasts during the early 1930's. Its plastic model is the master touch that will "finish" a boy's room, playroom, or den.

M. A model motoring layout combined with a gauge train system. All of the buildings shown here are available in HO-scaled plastic kits.

N. A pair of U.S. Air Force Pilot plastic figurines standing guard on a cache of books. For details on making bookends, see Figure 39.

O. Smoking accessories made by utilizing assembled plastic models. The tank is a model Russian "Stalin" tank; the jet is the Canadian AVRO CF-105 Arrow.

P. (Top) A ready-to-fly plastic model: The B-25 Mitchell Bomber. (Bottom) A color mixing guide. See Chapter 5 for details.



The balance of the mobile depends on placing the jets in a proper weight relationship. Since most of these models were designed for in-flight stand mounting, it is usually necessary to balance them in the desired flight position with modeling clay. This must be done before you cement the fuselage together. (See page 102.) Install the holding thread before assembling the fuselage. Tie a large knot in the end of the thread, place it in its proper position on the fuselage; then cement the fuselage halves together.

After the mobile has been assembled and balanced, it may be fastened to the ceiling or to a high archway. The slightest breath of air will send the jets and clouds into motion.

Mobiles can be assembled with all types of models—World War I and World War II aircraft, missiles and rockets, etc. When assembling them be certain to select models of the same scale. Clouds may be omitted, and the models may be hung from a "tree" arrangement made of wire clothes hangers. A few kit manufacturers are now making available ready-to-assemble mobiles featuring plastic scale models.

LAMPS. Many plastic models, such as totem poles and figurines, may be converted into unusual lamp bases. As shown in Figure 39, Detail A, the 12 1/2-inch model of a Winchester 1894R Rifle has been made into a lamp that is perfect for a boy's room or a den. The lamp socket and wiring may be purchased from your local hardware store. It should be fastened to the barrel with cement. The base should be wired during assembly, from the butt plate through the barrel. It will be necessary to drill a 1/4-inch hole in the receiver assembly and butt plate to pass the wire through. After the lamp socket and wire are installed and the rifle assembled, the butt plate can be set into a 6 x 6 x 3-inch block of wood and cemented. The wood should be finished as desired and drilled to accommodate the wire. To complete the lamp, purchase a decorative shade that depicts some phase of hunting.

BOOKENDS. Figurines, old-fashioned automobiles, and military tanks make conversation-pieces as bookends. See Photograph N and Figure 39, Detail A. The base and side of the bookend are made of 3/4 inch thick wood with rounded

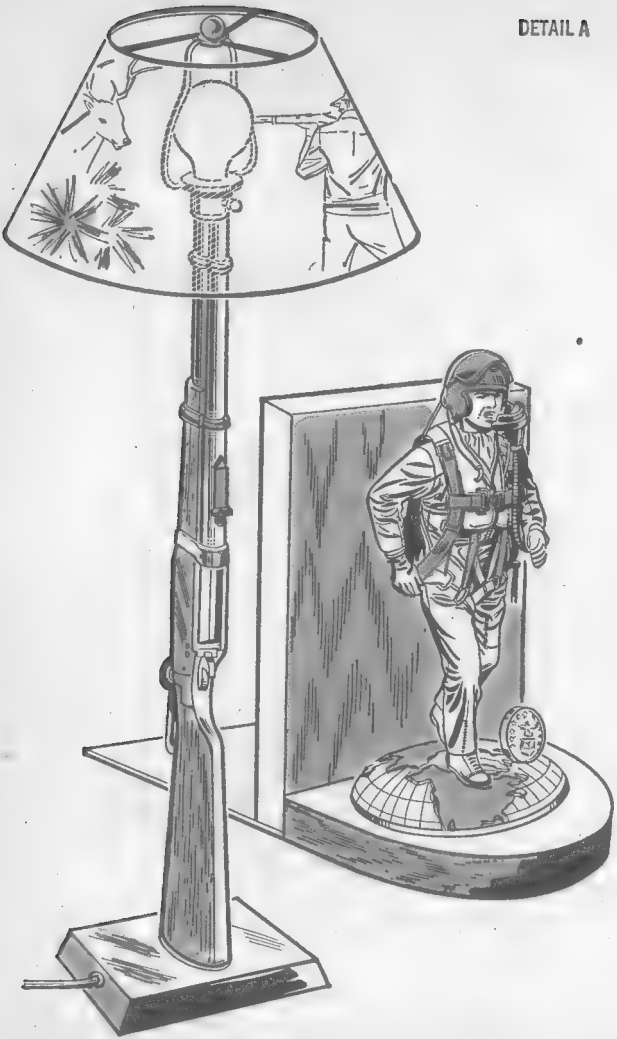


Fig. 39

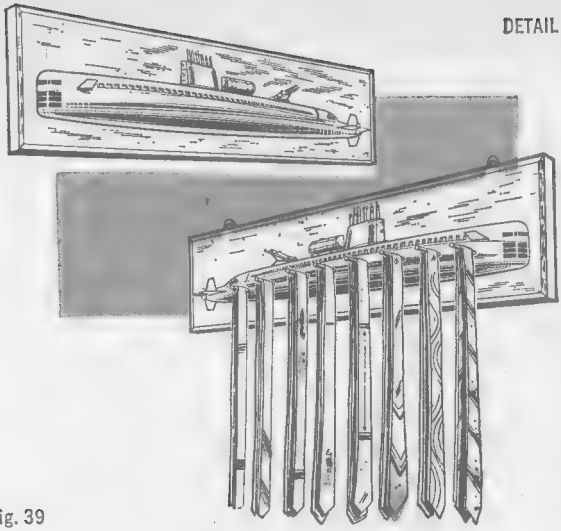


Fig. 39

ends. To hold the books in place, a piece of flat metal should be fastened on the side opposite the base. The figurines are secured to the base with screws and cement.

WALL PLAQUES. Many plastic models are composed of two identical halves. Included are most aircraft, jet, automobile, battleship, missile, helicopter, and figurine models. An interesting three-dimensional wall plaque can be made by assembling only half the model and cementing it to a piece of plywood or wood board of the proper size. Or, if you wish, the model half may be cemented to poster board and mounted in a picture frame. If both halves are mounted separately, you will have two wall plaques for the price of one plastic kit.

Wall plaques may be utilitarian as well as decorative. As shown in Figure 39, Detail B, half the submarine S.S.N. *Nautilus* has been assembled and cemented to a flat piece of wood as a decorative tie-rack. Small holes have been drilled in the side of the submarine and 1/8- or 1/4-inch dowels inserted and cemented in place. The assembled tie-rack unit can be fastened to a wall or a door as desired.

Finished plastic models may be utilized also to make dramatic shadow boxes. Some manufacturers are distributing kits which include the plastic model, a background scene, and frames. You can create your own shadow boxes by designing and building a frame of the proper size.

CIGARETTE BOXES AND ASH TRAYS. There are many other decorative uses for finished plastic models. A model car, tank, or jet, cemented to the top of a plain wood, metal, or plastic cigarette box, will make a handsome addition to a coffee table. Small models are best for desk ornaments, humidors, jewelry boxes, and other containers of this sort. Some plastic models, such as sports cars, army tanks (if the top turrets are left open), or helicopters (if the glass fronts are not installed), make attractive open cases for a few cigarettes.

Ash trays can be made more attractive by the addition of finished models. Photograph O shows a jet flying guard over a plain ash tray. The jet is held in place by a heavy wire—the wire from a clothes hanger will do—shaped as the in-flight stands that come with most kits. The wire is set in the slot molded originally for the in-flight stand. A word of caution: Plastic models must not come into direct contact with a lighted cigarette or cigar, and should be placed with this in mind.

Finished models of planes and jets may be converted into exciting light pole decorations. Autos may be incorporated into desk pen stands and memo pads, and figurines or open models may be used in floral arrangements and planters. In addition, models—either mounted or converted—make ideal gifts. They are welcome acquisitions for libraries, schools, and museums.

DISPLAYING YOUR FINISHED MODELS

To display a finished model, a stand or mount must be devised to hold it in position. Often the manufacturer supplies the stand as part of the kit; in other cases it is available as an extra. Most airplanes and jets have in-flight stands (Photograph F) which mount the aircraft by means of a tab on the leg of the stand inserted into the slot in the

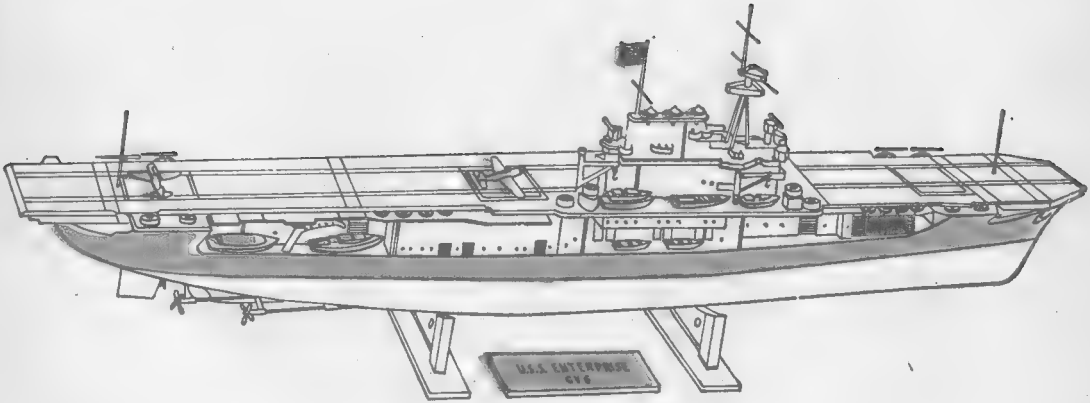


Fig. 40

bottom of the fuselage. Wall brackets, which are similar in design to the in-flight stands, may be employed to display your airplane collection. Most boat kits have stands or cradles that hold the craft for display. As shown in Figure 40, the U.S.S. *Enterprise* is mounted on its stand without cementing. The stand legs are screwed to a solid wood base, which is not ordinarily furnished with the kit.

There are some instances in which special stands are desirable. For example, you may wish to display an airplane on the ground rather than in flight. Such a decision must be made prior to assembly. Most large aircraft—especially the DC-8, Boeing 707, Convair 880, and various bombers—are tail-heavy and will not stand on their front nose wheels, the normal on-the-ground position. To overcome this problem, modeling clay can be installed in the nose to balance a model. The amount of clay required may vary from one-half to two ounces. If clay is not available, a large bolt nut may be substituted. It should be cemented in position.

Balance is also important when models are used in mobiles and in racing. In all cases, balancing must be accomplished during assembly.

To overcome the problem of dust, many hobby dealers have transparent covers or cases available in several sizes that will fit over many types of models (Photograph S). Or you can make your own cases of glass. Another solution is to make a cover of commercial transparent wrap supported by a wire frame of clothes hangers bent to the desired shape.

COLLECTING MODELS

Plastic models are made doubly interesting if the hobbyist collects historical profiles of his collection. A printed or typewritten card attached to the base of your model will add to its effectiveness as a display. We have developed such a profile for the B-17 to give you an idea of the form it might take:

SPECIFICATIONS

B-17 "Flying Fortress": manufactured by the Boeing Airplane Co., Seattle, Washington.

First test flown: October 30, 1935.
Out of production: 1945.
A total of 12,725 built.
Classification: Heavy Bomber.
Crew: 10.
Gross Weight: 55,400 lbs.
Wingspan: 103' 9".
Length: 74' 4".
Engines: 4 Wright R-1820-97, HP 1,200 each.
Top speed: between 256 MPH and 310 MPH (depending upon model).
These figures are for the B-17-G model of which 6,430 were built.

Or you may wish to write a more complete history to keep with your model:

HISTORY OF THE BOEING B-17
"FLYING FORTRESS"

The Boeing B-17, first constructed in 1935, became one of the most famous aircraft used throughout the Second World War. Built in large numbers, it was flown in practically every theater of operations under all climatic conditions. Many Boeing B-17 aircraft were destroyed by the Japanese during the bombing of Pearl Harbor and later at Clark Field in the Philippines, which indicates that this airplane was one of the first planes of the United States Army Air Corps to see action against the enemy in the Second World War. This airplane was responsible to a great extent for the total destruction of German war industry since it was used primarily in the Allied strategic bombing of enemy positions. Due to its long range, heavy bomb capacity, and ability to defend itself against enemy opposition, this plane was able to get through to bomb such targets as the tremendous ball bearing industry of Germany, the oil refining industry, submarine pens, enemy airdromes, and manufacturing plants throughout Europe.

Due to superior manufacturing techniques, the B-17 was built to withstand direct ramming by enemy aircraft. One B-17, Number 124406, was cut almost in half by an enemy ME-109 while flying over Tunisia. In spite of the tremendous damage sustained, the aircraft was able to return to its base, making a perfect landing. Other aircraft operating in the European theater returned from missions with noses blown off, large areas of wings destroyed, gaping holes throughout the fuselage, turrets blown out, and flying on only one engine. The incredible ruggedness of the Flying Fortress endeared it to its flight crews; its place in history is secure.

You can gather information such as this by doing research at your local library. The librarian will be glad to show you where to obtain the data desired. Also, many manufacturers include some historical background of the model's prototype on their instruction sheets.

Your model collection may be kept on shelves in your room or in the family den. If space is limited, you may wish to mount some of your models on the wall or to hang them from the ceiling in mobiles. Peg-board with a variety of wall attachments is another answer to the problem. An excellent space saver for model collectors is the totem pole arrangement shown in Photograph Q. The pole features the use of wall brackets.

Your collections, especially if you have complete historical backgrounds of your models, will be in demand for exhibits at local schools, libraries, museums, banks, and stores.

PHOTOGRAPHING YOUR SCALE MODELS

By combining photography and plastic model building, you will gain another exciting hobby—tabletop photography. Tabletop pictures are for the imaginative and the inventive. Since most model hobbyists who care about their avocation,

and devote considerable time, thought, and effort to it, have something of both these characteristics in their make-up, this should present no problem.

Tabletop photographs are miniature scenes, utilizing scale models and "manufactured" settings. Any camera may be used, but one that will focus at 3 1/2 feet with a lens opening of f/16 is preferable. A portrait lens attachment is also helpful, and a tripod or some kind of firm camera support is a must.

Because there is no action involved, the average tabletop picture can be taken at slow speeds or at time exposure. One movie bar light and a Number 2 photoflood lamp in a reflector will provide all the light you need. With long exposures, there is no need for extra-bright lights. Use ordinary 75-watt lamps, singly or in combinations, as close to your subject as possible. Use a medium speed film for all photographs of your models.

For practice, simple portraits of scale models will teach you a great deal about the rudiments of tabletop photography. There are many examples of model portraits in the photographic pages of this book. They were all taken with the simple equipment just described.

Once you have mastered the technique of photographing your models against plain backgrounds you are ready for more sophisticated shots. Remember, this type of picture should tell a story—dramatic, fanciful, comic, whatever you prefer. But in telling the story, beware of complicating it; simplicity is almost certain to give the best results.

Select your models and props carefully. Keep them in scale; if you are photographing an automobile model, surround it with objects that bear a correct size relationship to it. Be careful to keep the front-to-back dimension of your set or stage within bounds; otherwise, part of your picture will be out of focus.

In preparing a scene representing the seashore, use sand for the beach and cellophane arranged to simulate the surface of the ocean. For snow you will find salt or baking soda useful; for grass, a bit of plain carpet. Pebbles work out well as rocky ground, and cotton makes realistic clouds. In a street scene, cobbles may be faked by the use of dough,

plasticene, or a similar material crisscrossed in the manner of a cobbled street. Curbstones may be simulated in the same way.

Posters or framed scenic pictures will serve nicely as backgrounds. Perhaps one of your own pictures, enlarged, can be used. Sometimes the simplest of backgrounds will give the most dramatic effect. However, you can be as elaborate as your imagination and skill will allow.

PLASTIC SCALE MODELS AND MODEL RAILROADING

If you are a model railroader, plastic scale models will make your layouts more authentic. Several model manufacturers offer track-side accessories to scale. Railroad stations, houses, even trees are available in various sizes. Perhaps the greatest contribution which the plastic model industry has made to the realism of model railroad layouts is Model Motoring in HO scale, discussed in Chapter 8.

The terms "scale" and "gauge" often confuse the plastic kit builder and model railroader. Scale refers to the relation in size between the real thing (the prototype) and a model. As we know, plastic models are available in various scales, but most model railroad equipment is available in only four: O, S, HO, and TT. Rather than the term "scale" model railroad manufacturers prefer to use the word "gauge" to designate size. Gauge refers to the distance between the heads of the rails—or the distance between the wheels, another way of measuring the size of train equipment. The following chart compares the four common gauges of model railroads:

	O	S	HO*	TT
Proportion to protoype	1/48	1/64	1/96	1/120
Scale feet in decimals	.250″	.187″	.125″	.100″
Scale feet in fractions	1/4″	3/16″	1/8″	1/10″
Standard distance between rails	1 1/4″	7/8″	5/8″	1/2″

* Approximate, since the original measurements of this gauge were in millimeters.

The most popular gauge in model railroading is the HO gauge. When plastic model manufacturers design their kits for HO track-side accessories, they use this 1/96 scale.

To illustrate the assembly of an HO track-side accessory, we have selected the railroad station shown in Photograph E and in Figure 41. Here are step-by-step instructions:

A. ASSEMBLY OF STATION BUILDING

1. Locate and cement, from the inside, windows and doors to openings in walls.

2. Cement end walls to front wall. *Note:* End walls are interchangeable so that end wall with freight door may be placed either on the left or the right.

3. Cement rear wall to end walls.

4. Locate and cement wall assembly to base walk.

5. Locate and cement front roof and rear roof to walls.

6. Locate and cement front gable roof halves to front gable.

7. Locate and cement rear gable roof halves to rear gables.

8. Locate and cement roof extension supports to corners of walls.

9. Locate and cement front and rear roof extensions to front and rear walls.

10. Cement side roof extensions to side walls.

11. Locate and cement rain gutters to roof extensions.

12. Locate and cement 2 down spouts to gutters and walls.

13. Cement 3 light fixtures at top of doorways.

14. Cement 2 station sign boards to underside of side roof extensions.

15. Cement chimney halves together.

16. Locate and cement chimney to roof.

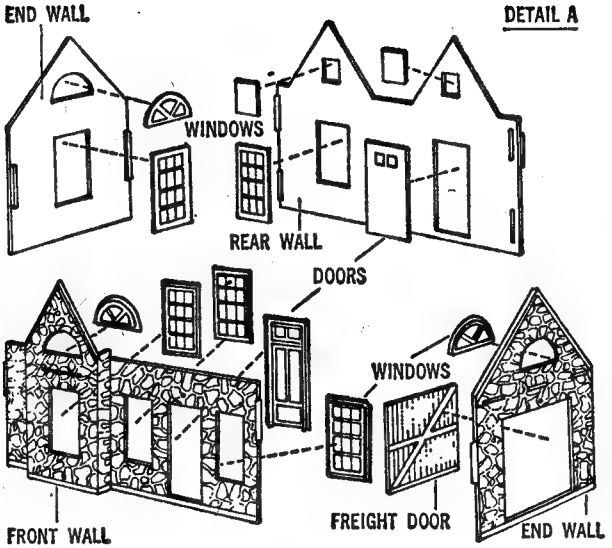
17. Cement chimney cap to chimney.

18. Locate and cement packing cases and trunks to walk in front of freight door of stations. Set aside to dry.

B. ASSEMBLY OF WAITING PLATFORM

1. Locate and cement roof support posts to platform.

2. Cement front and rear roof sections to roof support posts.


END WALL
DETAIL A
WINDOWS
REAR WALL
DOORS
WINDOWS
FRONT WALL
FREIGHT DOOR
END WALL

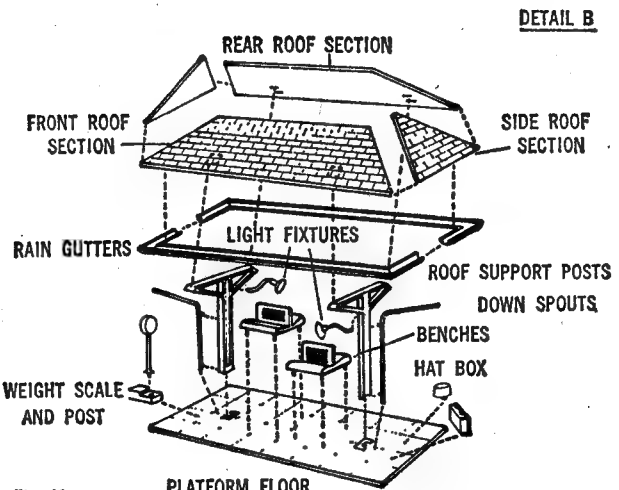

DETAIL B
REAR ROOF SECTION
FRONT ROOF SECTION
SIDE ROOF SECTION
RAIN GUTTERS
LIGHT FIXTURES
ROOF SUPPORT POSTS
DOWN SPOUTS
BENCHES
HAT BOX
WEIGHT SCALE AND POST
PLATFORM FLOOR

Fig. 41

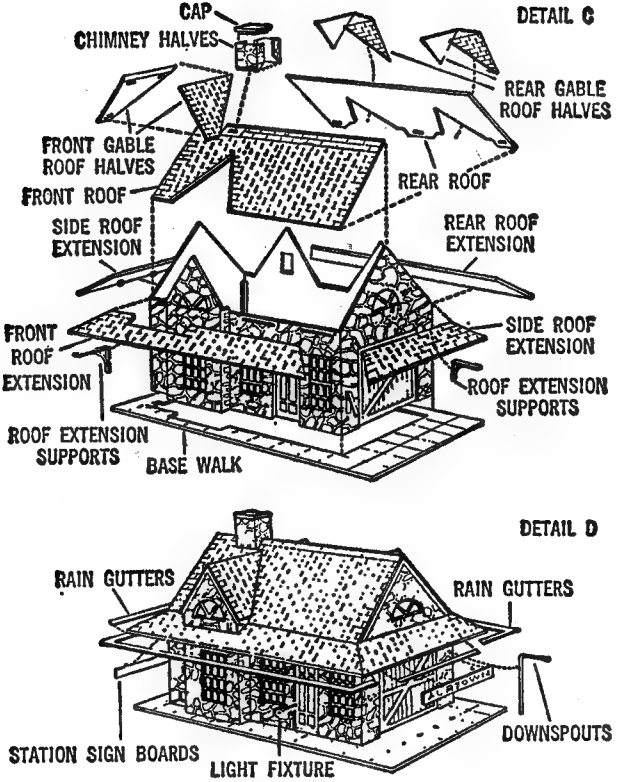

DETAIL C
CAP
CHIMNEY HALVES
REAR GABLE ROOF HALVES
FRONT GABLE ROOF HALVES
FRONT ROOF
REAR ROOF
SIDE ROOF EXTENSION
REAR ROOF EXTENSION
FRONT ROOF EXTENSION
SIDE ROOF EXTENSION
ROOF EXTENSION SUPPORTS
ROOF EXTENSION SUPPORTS
BASE WALK
DETAIL D
RAIN GUTTERS
RAIN GUTTERS
DOWNSPOUTS
STATION SIGN BOARDS
LIGHT FIXTURE
LIGHT FIXTURE
PACKING CASES
TRUNKS
LIGHT FIXTURE

Fig. 41

3. Cement roof sections to front and rear roof sections.
4. Locate and cement 2 benches to center of platform floor.
5. Cement rain gutters to underside of roof.
6. Locate and cement down spouts to roof support posts and rain gutters.
7. Cement 2 light fixtures to inside of roof support posts.
8. Cement weight scale posts and platform sections together.
9. Locate and cement weight scale to one end of platform floor.
10. Locate and cement suitcase and hat box to platform floor.

The possibilities for putting your plastic models to use are unlimited. A little thought, imagination, and ingenuity should enable you to find practical uses for all the plastic scale models you assemble.

7

MOTORIZED PLASTIC SCALE MODELS

Until now we have dealt primarily with the construction, assembly, and decoration of plastic scale models for display. In the next three chapters, we will take a look at the plastic scale models that offer action as well as beauty and authenticity.

Motorized models are usually powered with electricity. (A few, as described later in this chapter, are driven by carbon dioxide or by jet cartridges.) They are self-propelled, with electric motors and batteries contained within the models. No outside wires or control lines are needed. Some manufacturers offer hand-held remote control units which allow operation of the models from some distance away.

There is also a group of plastic scale models that perform action of some type that have no electrical or jet power. In this group, we find such models as airplanes that have retractable landing gear, as well as submarines and warships that fire missiles. These features are generally spring-powered.

Most motorized plastic kits come complete with all the necessary equipment for power—electric motors, battery receptacles, on-and-off switches, drive gears or belts, hook-up wires, and motorizing instructions. In some cases, these items must be purchased separately as companion parts. Batteries are seldom included with kit units. These may be obtained at small cost from your local hobby dealer or other neighborhood stores.

The range of motorized plastic models is almost as wide as is the range of display models. For example, manufacturers are making model submarines that dive, surface, turn in water, and fire missiles; army tanks that climb over obstacles and fire shell after shell; airplanes that maneuver on the ground; and scaled V-8 automobile motors and aircraft engines that function exactly as their big brothers, the prototypes. Some of the scale models described in the previous section can be motorized without much difficulty if you should wish to do so. Of all the motorized types, automobiles —antique, sports, or customized—are probably the most popular, as may be seen by the number offered by manufacturers.

TIPS ON MOTORIZING PLASTIC MODELS

The assembly of motorized plastic models follows the same general steps as described in Chapter 3 for solid models.

Some plastic parts, which are normally used in a decorative model, may be left over when a motorized model is assembled. These parts may be discarded if you wish. In most cases, the motorizing assembly should be completed before you begin to work on the model itself.

Great care is required in the assembly of motorized boat hulls and their compartments since water-tight joints are a necessity. By following the manufacturer's instructions to the letter and by cementing carefully, the builder should have no trouble achieving water-tight integrity.

In some motorized models, parts are held together with screws and nuts, enabling you to disassemble, repair, and adjust your model as often as you wish. Since it is usually not practical to provide threaded holes in styrene plastic, special "pockets" are often designed to position the nuts and to prevent them from rotating. Since these nuts may be inaccessible once you have begun an assembly, it is wise to cement them into their proper places before starting the final steps. This is easily accomplished as follows:

1. Apply a very thin coat of cement to the pocket area.
2. Locate the nut in the pocket, making certain that holes

in the nut and the plastic are aligned properly.

3. Remove any excess cement from the holes. A toothpick or similar object inserted through the nut and the hole in the plastic will do the job, and will also help with the alignment.

4. Apply additional cement to the top surfaces of the nut where it contacts the side walls of the pocket.

Some manufacturers cut the wire used in electrical connections to proper length, while others supply the bulk wire. If it is necessary, cut the wire with a pair of small wire cutters or a pair of old scissors. Insulation may be stripped from the ends of the wires—usually for 1/2 to 1 inch—by carefully cutting it with a knife and pulling it off. Be careful to avoid cutting the wire itself since this may impair the electrical contact. After the insulation has been stripped, twist the loose strands of the bare wire together so that better contact can be made.

Electrical connections require the bare wire to be in *firm* contact with the proper terminal. For solid contact, holes are generally provided in the terminals so that wires can be inserted and twisted tight. Press the wires against the terminal with your fingernail.

In some kits, metal or plastic eyelets or rivets are used to assure a firm electrical connection. In such cases, the bared wire is twisted around the eyelet or rivet and pushed into the terminal or terminal strip. To prevent the rivet or eyelet from coming loose, flare it by pressing down hard on the end with the heated blade of an old knife. *Do not get the knife blade too hot.*

In other kits, the wires are held to the terminals with screws. To make the electrical connection, twist the bared wire around the screw or terminal post in a clockwise direction; then tighten the screw against the terminal. While the wire can be twisted and bent with your fingers, in all cases a pair of small, long-nose pliers will make the job easier and more professional.

The electric motor should be tested to make certain that it operates before it is installed in the model. This can be done by touching the motor's wire leads to the proper terminals of the battery.

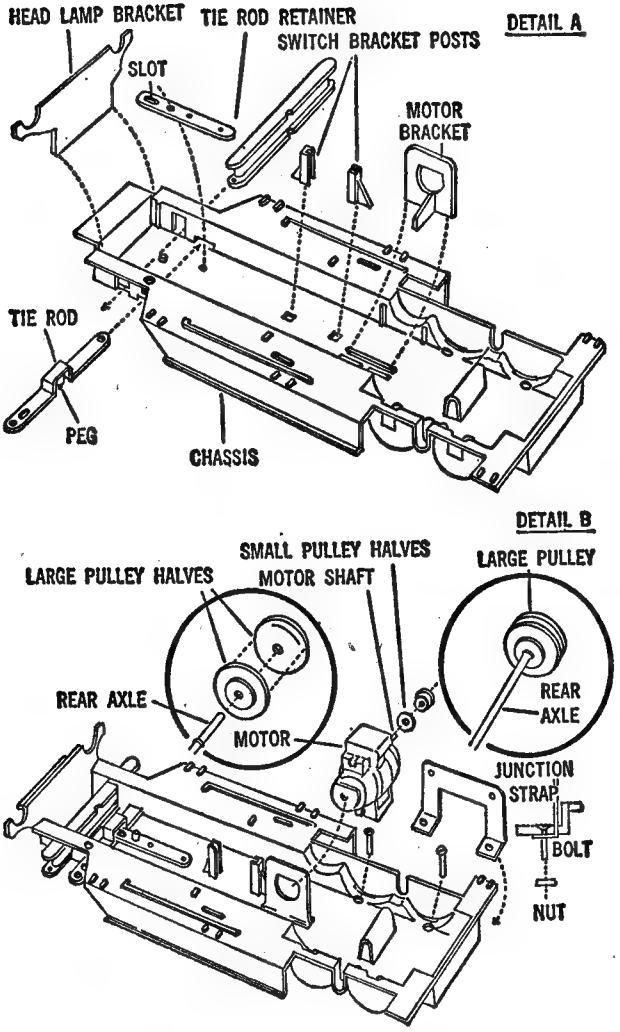
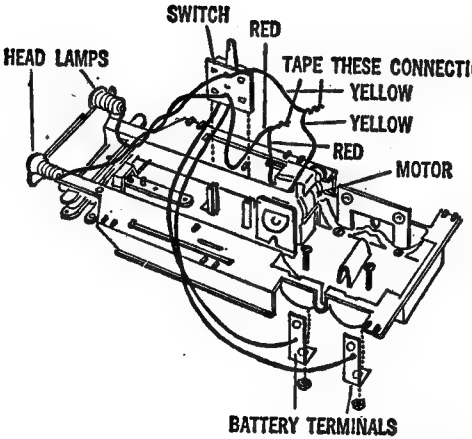

HEAD LAMP BRACKET
TIE ROD RETAINER
SWITCH BRACKET POSTS
DETAIL A
SLOT
MOTOR BRACKET
TIE ROD
PEG
CHASSIS
DETAIL B
SMALL PULLEY HALVES
LARGE PULLEY
LARGE PULLEY HALVES
MOTOR SHAFT
REAR AXLE
REAR AXLE
MOTOR
JUNCTION STRAP
BOLT
NUT

Fig. 42

DETAIL C



DETAIL D

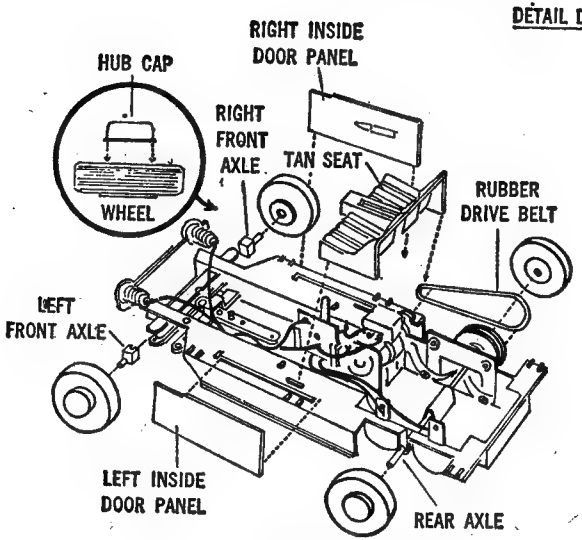


Fig. 42

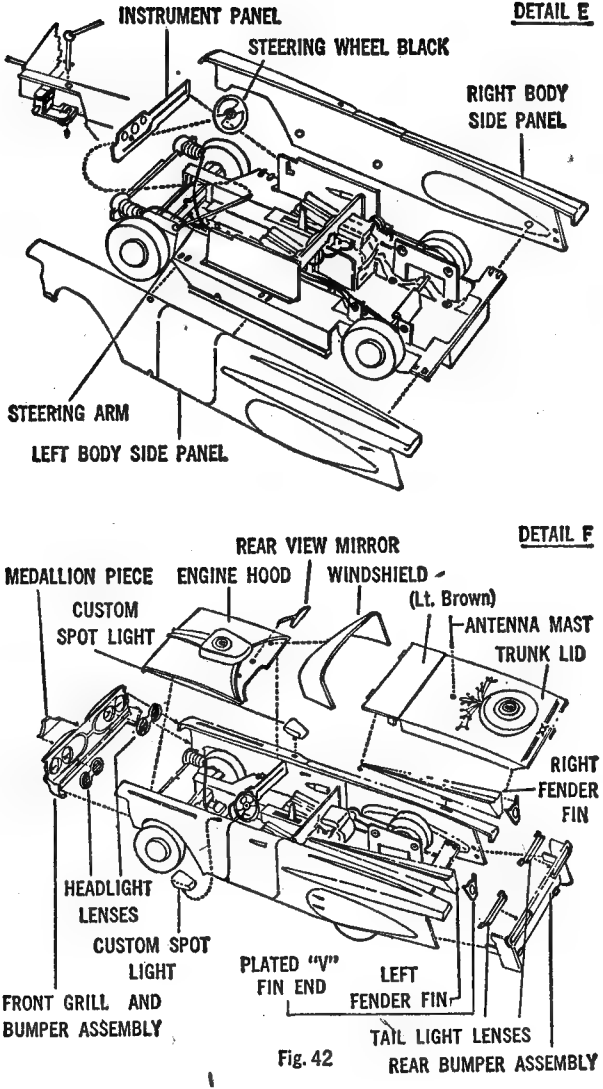

DETAIL E
INSTRUMENT PANEL
STEERING WHEEL BLACK
RIGHT BODY SIDE PANEL
STEERING ARM
LEFT BODY SIDE PANEL
DETAIL F
REAR VIEW MIRROR
MEDALLION PIECE
ENGINE HOOD
WINDSHIELD
(Lt. Brown)
CUSTOM SPOT LIGHT
ANTENNA MAST
TRUNK LID
RIGHT FENDER FIN
HEADLIGHT LENSES
CUSTOM SPOT LIGHT
PLATED "V" FIN END
LEFT FENDER FIN
FRONT GRILL AND BUMPER ASSEMBLY
TAIL LIGHT LENSES
REAR BUMPER ASSEMBLY

Fig. 42

The methods used to drive modls differ from manufacturer to manufacturer. Some use a pulley-drive system (Figure 42); some employ plastic gears; while others use a friction-drive system with the motor shaft running against the tires. When gears are used, they should be tested to make certain that they mesh properly. Trim the plastic where necessary with a sharp knife or razor blade. A small file will aid in cleaning burrs from the metal shaft ends so that they will slide into the plastic more easily. The gears should be pushed or forced into their proper positions. A small hammer may be used to tap them lightly into place.

When the gear assembly is completely installed it should be tested. Connect the motor leads to the battery terminals and turn the switch to "on." Check to see that all the gears are engaged and that the drive is rotating properly. (If your engine is rotating in the wrong direction, reverse its leads.) The sound of the motor and the gears should be smooth and even. Erratic grinding noises may be due to flashing and burrs on the gear teeth; it will diminish as your system is broken in. Break-in runs are advisable, but should be limited to about 10 minutes each, with sufficient time between runs to allow the batteries to recuperate. If the assembly does not operate properly, retrace your steps to make certain that each component is in working order. In some cases, it may be necessary to lubricate the gear teeth with vaseline or mineral oil.

To illustrate these steps in an actual assembly, we have selected the scale model of the famous wide-track Pontiac (Figure 42). While the following steps are specifically for the Pontiac, they are general enough to be used in motorizing all scale automobiles.

DETAIL A

1. Cement motor bracket to chassis.
2. Cement switch bracket posts to chassis.
3. Place tie rod retainer onto peg in chassis.
4. Insert tie rod through slots in chassis with slotted end of tie rod on left side and peg in center of tie rod, into slot in tie rod retainer.
5. Insert front cross axle through slots in chassis so that half round slot locks against peg in chassis.

6. Cement head lamp bracket to front end of chassis.

DETAIL B

7. Cement halves of large pulley together and cement against stop ring on rear axle. Set aside to dry.

8. Cement halves of smaller pulley together and press onto motor shaft. Locate centrally.

9. Insert junction strap through slots on right side of chassis and fasten securely with nuts and bolts.

10. Snap motor into position on chassis.

DETAIL C

11. Insert lamps and switch of electrical harness into position on chassis.

12. Insert battery terminals on harness through slots in left side of chassis and fasten securely with nuts and bolts.

13. Strip about 1/2 inch of insulation off loose ends of red and yellow wires on harness and twist onto same color wire on motor. Wrap a small piece of electrical tape around bare connections to prevent short circuits.

DETAIL D

14. Push wires down into center of chassis and cement seat over switch onto chassis.

15. Press hub caps into wheel centers.

16. a. Insert rear axle into axle cradle in chassis and press on wheels.

b. Make certain that wheels and axle rotate freely, then place rubber drive belt over small motor pulley and large wheel pulley.

17. Snap left and right front axles onto front cross axle and insert pegs on axle knuckles into holes in tie rods.

18. Press wheels onto front axles.

19. Cement left and right inside door panels to chassis and side body panels.

DETAIL E

20. Cement left and right body side panels to chassis and inside door panels.

21. Insert steering arm through slotted hole in left side of chassis and into slotted hole in tie rod.

22. Pass hole in instrument panel (dash-board) over end of steering post and cement to inside door panels. *Note:* For better adhesion when cementing plated parts, it is

recommended that a little of the plating be scraped off at the points where plated part is to be cemented to other parts.

23. Cement steering wheel to steering post.

DETAIL F

24. Cement medallion piece to front of front grill and bumper assembly.

25. Cement headlight lenses to back side of front grill.

26. Cement tail light lenses to back side of rear bumper assembly.

27. Cement front grill to chassis and side body panels.

28. Cement rear bumper assembly to chassis and side body panels.

29. Cement plated "V" fin ends to left and right fender fins.

30. Cement left and right fender fins to rear fenders.

31. Cement engine hood to dash board and medallion piece.

32. Cement rear view mirror to hood.

33. Cement windshield to hood.

34. Cement custom spot lights to front fenders.

35. Cement antenna mast to trunk lid.

36. Snap trunk lid into position. *Do not cement.* This is easily removed for replacement of batteries.

37. Cut out sections of customizing decals desired and apply to model. Paint parts as indicated in drawings and allow to dry before assembly.

38. To operate car, install 2 size "C" batteries (not furnished with kit) in proper position, as shown, in trunk of model.

CHECKING FOR TROUBLE IN MOTORIZED AUTOMOBILES

The following is a list of common things to check should your motorized model develop trouble or fail to operate:

1. *Batteries are old or weak.* Replace with new batteries.

2. *Batteries are loose.* Be sure batteries are in their proper positions and are not free to move about. Batteries can be kept in place with masking tape or rubber bands.

3. *Battery terminals or junction straps are not touching one or both batteries.* Adjust metal contact or contacts by bending with your fingers.

4. *Wire connections are loose.* Tighten connections or make new ones.

5. *One lamp bulb is working; the other is not.* Check to see if the lamp bulb is burned out, if the wiring is loose or connected improperly.

6. *Rear axle is not turning.* In pulley-driven models the rubber drive may be slipping off the pulleys and can be corrected by tightening. On models using gear drives, the large gear may be binding against the small gear. This can be corrected by shifting the large gear slightly away from the small one. If the small gear is touching the motor, it should be pulled free.

8. *Front wheels are binding on their axles.* Apply a drop of oil to each wheel bearing or axle. Roll the car back and forth on the *front wheels only* until they roll freely.

9. *Rear wheel hubs are binding against axle cradle or wheel hangers.* Shift wheels slightly away from cradle or hangers. If you should oil the rear wheels, be careful to avoid getting any oil on the drive belt or pulley.

10. *Motor is loose in its housing.* This can be remedied by inserting a paper or cardboard shim of the proper thickness to take up the unwanted play.

OPERATING MOTORIZED AUTOMOBILES

Operating your motorized auto under its own power can be a great deal of fun. But racing it in competition with your friends' models increases your enjoyment ten-fold. Several vehicles may be raced at the same time, but a guide line is needed to keep them running in a straight course and to avoid unnecessary accidents. For this purpose, use a strong piece of thread or fishline that will stretch the length of the course. (Thirty-five to fifty feet is a good length for a track.) Choose a smooth flat area for the greatest possible speeds, and stretch the line taut. To keep it tightly in place, make a loop in each end and slip a weight—such as a brick or a stone,—through each.

To keep the cars running on the line, guides should be cemented to the front and rear axle cradles. In some kits, these guides are included as part of the unit. If they are not, you can make them from leftover plastic scraps as shown in Figure 43. Use a heated knife to cut the slot in the guide.

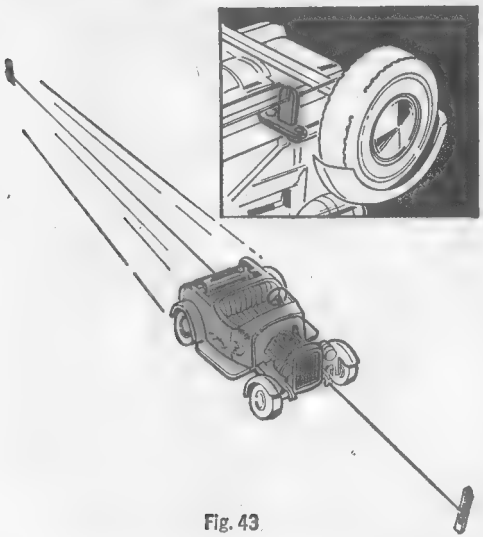


Fig. 43

After cementing the guides in place, allow them sufficient time to dry thoroughly before racing the car. Make certain that they are at the proper height and that they do not interfere with the wheels of the vehicle.

When you are ready to race, pass one end of the line through the guide on the front axle and then through the rear guide. Weight the line to hold it taut. A large pillow should be placed at the end of each guide line to stop the vehicles without damaging them.

Continuous operation of motorized models is not recommended since their batteries are relatively small. They require time to recoup their energy after each run. The best possible performance from your auto can be obtained, of

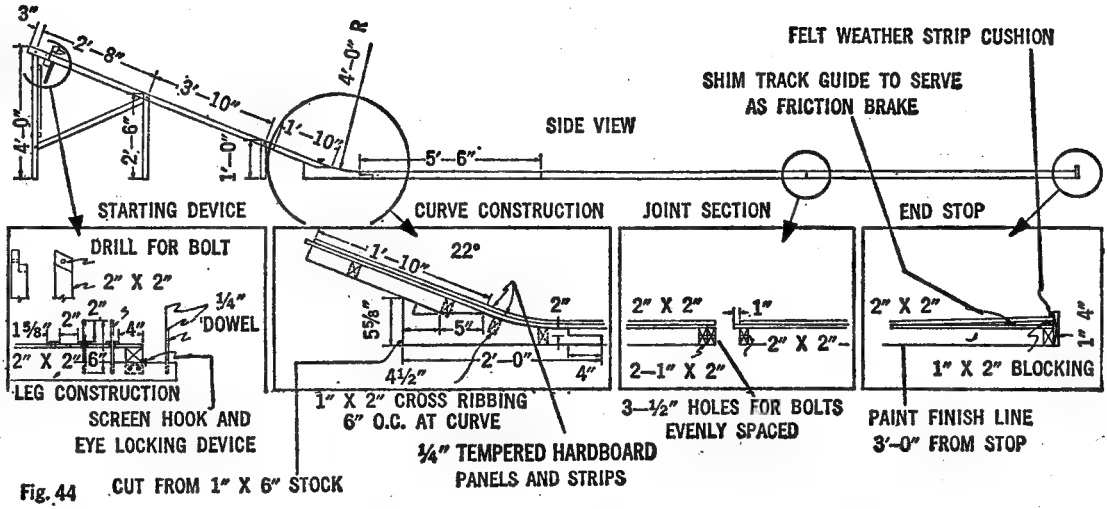

3"
2'-8"
3'-10"
4'-0" R
4'-0"
2'-6"
1'-0"
1'-10½"
5'-6"
SIDE VIEW
FELT WEATHER STRIP CUSHION
SHIM TRACK GUIDE TO SERVE AS FRICTION BRAKE
STARTING DEVICE
CURVE CONSTRUCTION
JOINT SECTION
END STOP
DRILL FOR BOLT
2" X 2"
¼" DOWEL
1⅝"
2"
2"
4"
2" X 2"
6"
LEG CONSTRUCTION
SCREEN HOOK AND EYE LOCKING DEVICE
1'-10"
22°
5⅝"
2"
5"
2'-0"
4½"
4"
1" X 2" CROSS RIBBING 6" O.C. AT CURVE
2" X 2"
1"
2" X 2"
2—1" X 2"
3—½" HOLES FOR BOLTS EVENLY SPACED
2" X 2"
1" 4"
1" X 2" BLOCKING
PAINT FINISH LINE 3'-0" FROM STOP
¼" TEMPERED HARDBOARD PANELS AND STRIPS
CUT FROM 1" X 6" STOCK

Fig. 44

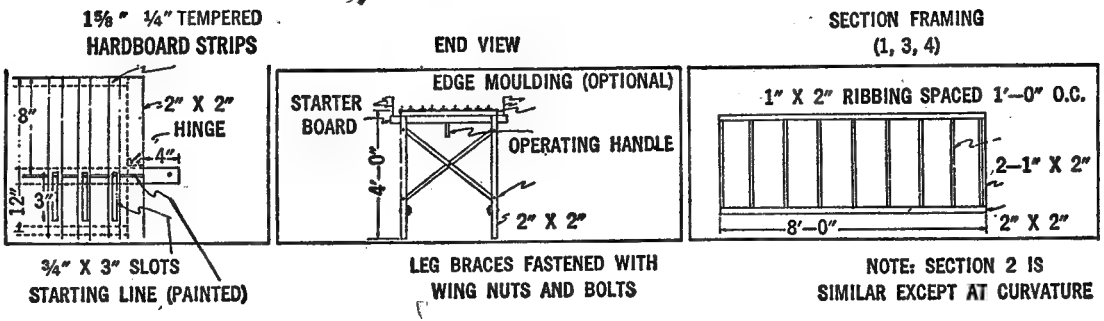

1⅝" ¼" TEMPERED HARDBOARD STRIPS
END VIEW
SECTION FRAMING (1, 3, 4)
8"
2" X 2"
HINGE
4"
12"
3"
¾" X 3" SLOTS
STARTING LINE (PAINTED)
EDGE MOULDING (OPTIONAL)
STARTER BOARD
OPERATING HANDLE
4'-0"
2" X 2"
LEG BRACES FASTENED WITH WING NUTS AND BOLTS
1" X 2" RIBBING SPACED 1'-0" O.C.
2-1" X 2"
8'-0"
2" X 2"
NOTE: SECTION 2 IS SIMILAR EXCEPT AT CURVATURE
2'-10"
8'-0"
8'-0"
8'-0"
8'-0"
TOP VIEW
SECTION 1
SECTION 2
SECTION 3
SECTION 4

Fig. 44

course, with new, fresh batteries. For best results always use the size recommended by the manufacturer of your kit.

Figure 44 shows a track arrangement that will give realistic racing action for plastic scale auto models, whether motorized or not. (The vehicles described in Chapter 4 may be raced on a track like this.) This gravity track is easily constructed of inexpensive materials. All wood members are fastened together with nails or with screws, and tempered hardboard panels should be fastened to frames with glue and brads spaced 4 inches on-center along all framing members. Lay out the two center tracks accurately, then use 2-inch blocks to space the outer tracks. Raise the track strips at the end of the last section with blocks or washers to the height shown in the detail. The panels and the framing should be finished with a wood sealer and two coats of a quality grade spar varnish.

For a colored race track, use a primer and finish with two coats of paint recommended for wood. Use a quality exterior oil-base house paint if the race track is to be outdoors. When a metal edge molding is used, it should be installed after the protective finish is completely dry.

To gain speed on a gravity race track, experiment by adding weights to the body of the vehicle. (See page 102.) Cars used in racing competitions are usually stripped of all unnecessary equipment. If you wish to build your model as a competition car, study the parts and the instruction sheet, and decide which features should be changed or eliminated before you begin assembly.

Motorized cars may be run without guide lines, but care should be taken to prevent collisions with walls and furniture. If any part becomes broken or cracked, it can generally be repaired with polystyrene cement. Apply the cement carefully to the broken surfaces and clamp them together if necessary. When the cement has dried, clean the repaired seam with the abrasive paste described on page 23.

JET-POWERED RACERS

Many racing scale models may be made operational with the addition of a carbon dioxide cartridge or a similar unit.

Jet power makes it possible to attain speeds as high as 75 miles per hour.

These power units are not ordinarily furnished by the manufacturer with the kit. They may be obtained at your local hobby dealer's. He will be able to advise you as to the best jet unit for the scale racer you wish to power. Following are some general points which should be kept in mind when using carbon dioxide cartridges and similar jet engines.

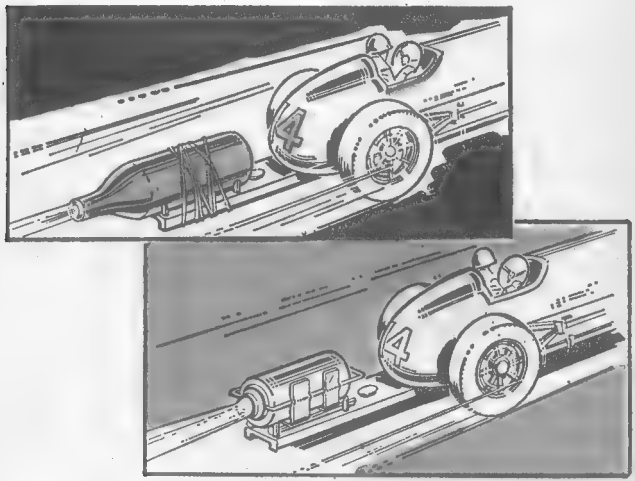


Fig. 45

The CO_2 cartridge is attached to the rear of the racer (Figure 45) on a plastic mounting strip cemented to the underside of the vehicle. The cartridge is held in place in a metal mounting clip or by a rubber band wrapped around the cartridge and mounting strip. With jet engines, it is absolutely necessary that the metal mounting clip and screws be insulated from the plastic mounting strip. Without this precaution, the extreme heat of the jet engine will cause the plastic to soften and warp. Insulate the mounting strip by placing small pieces of wood about 1/8 inch thick, or lengths

of headless wooden matches on the top and bottom of the mounting strip.

The addition of a metal cartridge or a jet engine will destroy the balance of your model. To correct this, place the racer on a level surface and add modeling clay or large metal nuts to the front of the body under the hood until the front wheels touch the ground. Use cement sparingly to hold the nuts in place. After the racer is balanced properly, cement the hood in place.

Several types of guns are used in puncturing the cartridge. They are available at hobby shops. The gun usually has a spring-operated plunger with a pin in its head. The plunger is locked in position by the trigger. To puncture the cartridge, place the gun over the end of the cartridge and press the trigger to release the plunger.

Jet engines have various types of ignition fuses which set them in operation. It is important to remove most jet engines from their mounting clips with pliers *immediately* after the run to prevent damage to the plastic mounting strip. A word of caution: Do not expose or store carbon dioxide cartidges near heat. It will cause the carbon dioxide to expand and may explode the cartridge.

For high speed jet racing, a track or "drag strip" should be set up on a long smooth surface such as the floor of a gymnasium. Guide lines should be of nylon fishline or thin wire approximately 100 to 150 feet long. Jet engine powered vehicles racing against each other should have fuses of the same length. A soft pillow or a large cloth draped over the guide line should be used as in motorized racing. A *tiny* drop of machine oil applied to each axle will add speed and smoothness for the run.

Plastic scale model racing is an excellent tournament activity, a training ground for the rules of sportsmanship and fair play. It draws friends together for exciting moments of action, building a spirit of friendly competition among both participants and spectators.

8

MODEL MOTORING IN HO SCALE

As we saw in the last chapter, motorized scale model auto racing requires a large unobstructed area. This can be a major problem for the model racing fan, especially during the winter months. Model Motoring* overcomes this difficulty for it is an electrically-powered system of plastic model cars and trucks designed to run on a highway layout. Model Motoring is quite similar to model railroading—the highway sections are comparable to the railroad track, the motor-powered vehicles to the trains.

Vehicles and their driving lanes are scaled to HO size so that the hobbyist can use scale accessories in planning authentic roadway systems. The hobbyist can create replicas of such famous race tracks and circuits as the Mille Miglia, Le Mans, Pebble Beach, Bridgehampton, Targa Florio, Sebring, Indianapolis, Watkins Glen, and Palm Springs; or he can design normal highway layouts with such features as flyover bridges, straightaway stretches, banked curves, tunnels, and right-of-way crossovers.

There is no limit to the racing potentials of Model Motoring—drag races may be held on a competitive basis; record-breaking speeds may be reached on straight stretches; team racing may be organized for the fastest cars in the area. Quarter-mile, half-mile, or mile distances can be accurately measured and timed for recorded runs. The best part of Model Motoring is that speedways can be arranged

* *Model Motoring* is a registered trademark of the Aurora Plastics Corporation.

compactly on platforms or tabletops measuring 5 x 9 feet, 4 x 8 feet, or even 4 x 4 feet.

Model Motoring with its HO road system may be built into a gauge electric train layout (Photograph M). Perfect as railroad layouts are in detail, roads, highways, and moving vehicles other than trains have been lacking in the past. When model railroads are integrated with Model Motoring, authenticity is complete. Imagine the added excitement if moving automobiles stop as crossing gates come down, a sports car whirls down a straightaway, a car passes a truck lumbering up a grade.

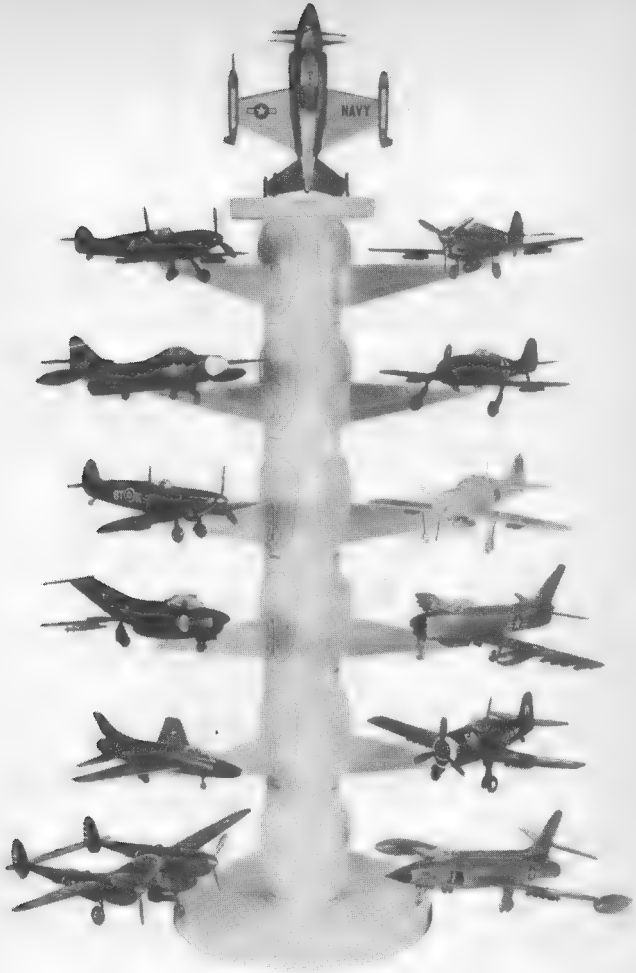
Such HO-scaled items as junction switches, trestle supports, guard rails, grade crossings, and automatic traffic signals add to the realism of HO layouts. This means that you can plan both railway and highway systems, and create whole cities alive with activity.

Model Motoring vehicles run from the same power source as electric trains, and are handled from a remote control box.

There is a wide range of vehicles available—Corvettes, Thunderbirds, Mercedes Benz 300 SL's, Jaguar KK 140's, convertibles, hardtops, taxicabs, station wagons, police cars, trucks with flat-, van-, or stake-bodies, tractor trailers, and dump trucks. These plastic-bodied autos and trucks are authentically detailed, right down to the hub caps, and can attain *scale* speeds of 150 miles per hour.

The vehicles ride a two-lane highway and raceway that comes in curved and straight sections which snap together to form the roads and junction turnoffs. These roads may be simple throughways or complex cloverleafs. There are also inside curve sections available which interlock to make four-lane superhighways or raceways (Photograph V). The road sections are molded in high-impact plastic that looks like asphalt; they carry thin, imbedded nickel-silver strips that conduct low-voltage current from a power pack or transformer directly to the car. This energizes a tiny motor, smaller than a dime, within the car which in turn activates the rear wheels with unbelievable power and drive.

One standard train 12-24 AC or DC three-quarter ampere transformer will generate sufficient power to run ten cars



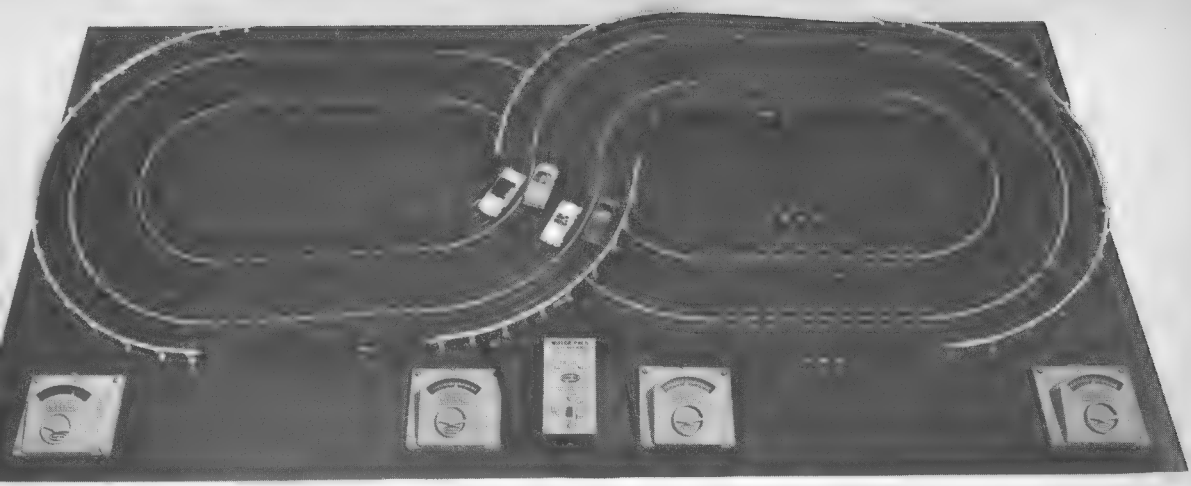
Q. A totem pole may be the answer to your space problems. Models are held in place with plastic wall brackets.

R. (Top) A Pan-Am Boeing 707 photographed on an asphalt road with snow as background. (Bottom) A Delta Convair 880 against a painted cardboard sky.

S. Plastic models encased in plastic covers. These covers are available from hobby dealers, or they can be made easily and inexpensively in your own workshop. See Chapter 6.

T. A plastic task force cruising for trouble on its mounting stands.

U. A task force in action. The aircraft carrier is the U.S.S. Enterprise; the destroyers are of the Fletcher Class. Photograph X shows the set-up that was used to produce this realistic battle shot.



V. A typical four-lane model motoring layout with controls ready at hand for speedway racing.

W. A dogfight between a Japanese Zero (left) and an American Flying Tiger. There is no end to the excitement and realism you can achieve with tabletop photography.

X. All photographs in this book were made on a table. The top photograph of the Flying Boxcar shows how a clamp is used to suspend the plane before a painted cardboard sky. The battle scene (Bottom) was made against a gray screen with cotton as the water spray.

simultaneously. The vehicles are maneuvered in their lanes via speed control units which the operator "drives." A driver can steer his car on the straightway, around a curve, or have an end-swiping misadventure without getting out of his easy chair.

ROADWAY ASSEMBLY

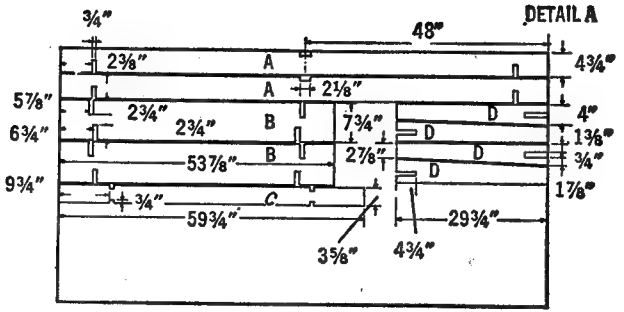
Your roadway may be assembled on the floor, on a counter, or on a table, and dismantled when you are through. This procedure will serve for a short time, but sooner or later you will want a permanent base for your roadway. Such a base will save wear and tear on both you and your equipment.

For a permanent installation of roadway sections, a table is ideal. It must be firm, but it does not have to be made of expensive lumber. The table shown in Figure 46 will accommodate the largest track layouts shown in Figure 47, or the dimensions may be reduced to fit the space available. If built according to dimensions, you can use one side for the installation of your roadway and the other side for table tennis.

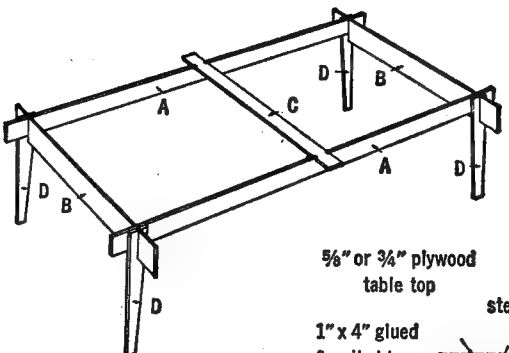
The top, which will fit either the plywood or the alternate lumber frame, can be made from one piece—a 5 x 9 foot plywood panel, or a panel cut in half to 5 x 4 1/2 feet with a piano hinge at the center. The drawings show this hinge detail. If you use the hinged top, the table can be stored in a smaller space.

To make the interlocking plywood, carefully mark out the frame pieces to dimension—allowing for saw kerfs—on a 4 x 8-foot panel or on a 8 x 2 1/2-foot panel. Now cut the pieces to size with a sharp handsaw, or a power saw if one is available. If the completed piece is to be rigid, the notches in each piece must be accurate. Notches can be made easily by drilling a hole at the bottom line and sawing in from each edge as far as the hole. Trim the corners with a chisel. Sand all edges to prepare for finishing before assembly. When finishing is complete, assemble as shown.

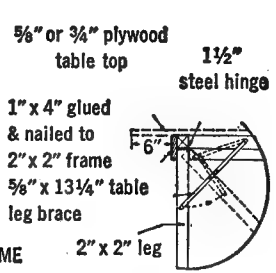
To make the alternate lumber base frame, measure and cut the framing members, legs, and rails to the proper length.



CUTTING DIAGRAM FOR INTERLOCKING PLYWOOD BASE FRAME
¾" x 4'-0" x 8'-0" PLYPANEL A-D OR EXTERIOR A-C



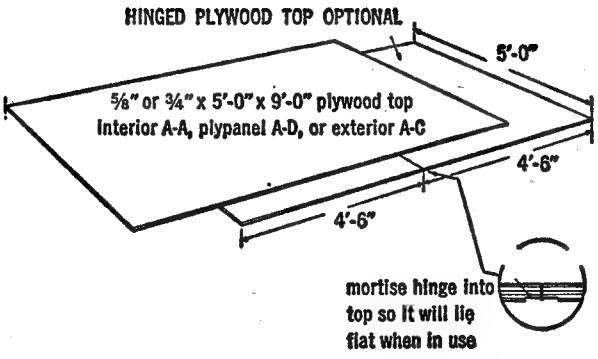
INTERLOCKING PLYWOOD BASE FRAME

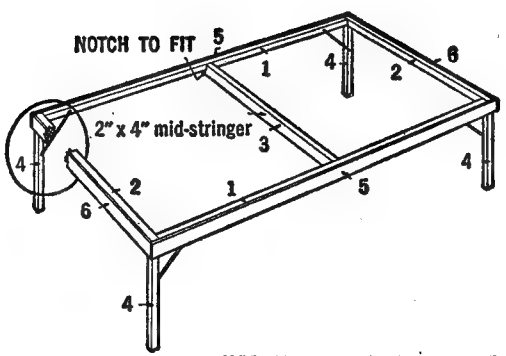


FOLDING LEG DETAIL

Fig. 46

DETAIL B





ALTERNATE LUMBER BASE FRAME

Fig. 46

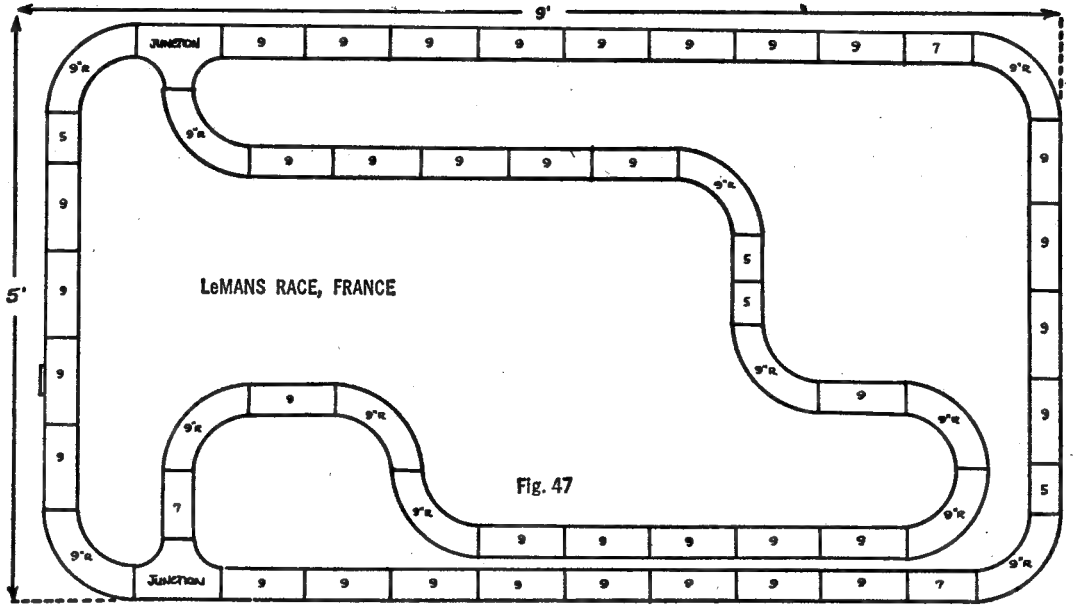


Fig. 47

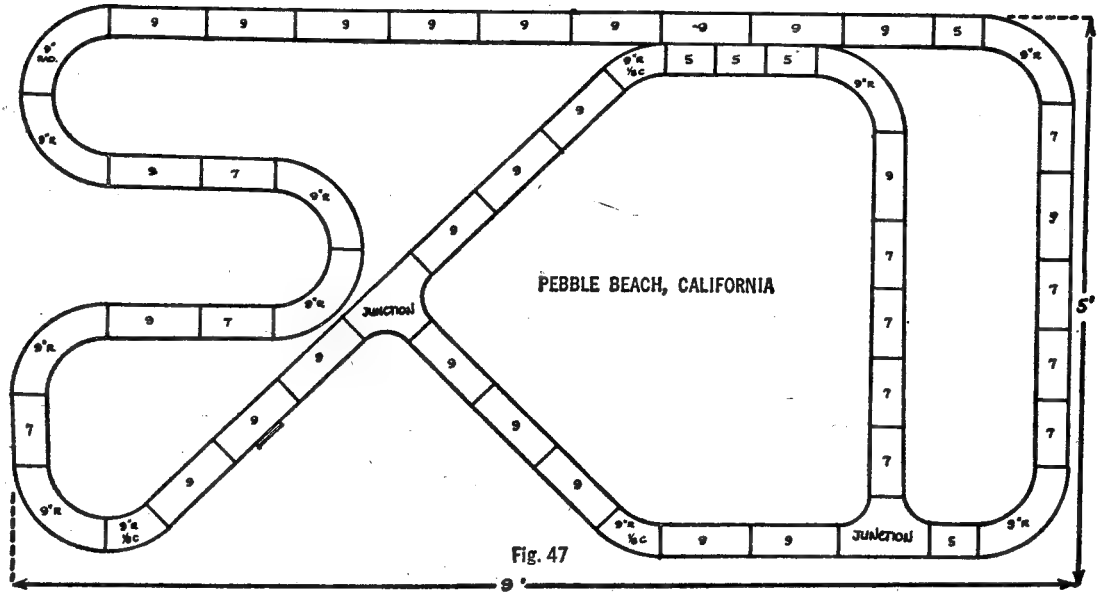


Fig. 47

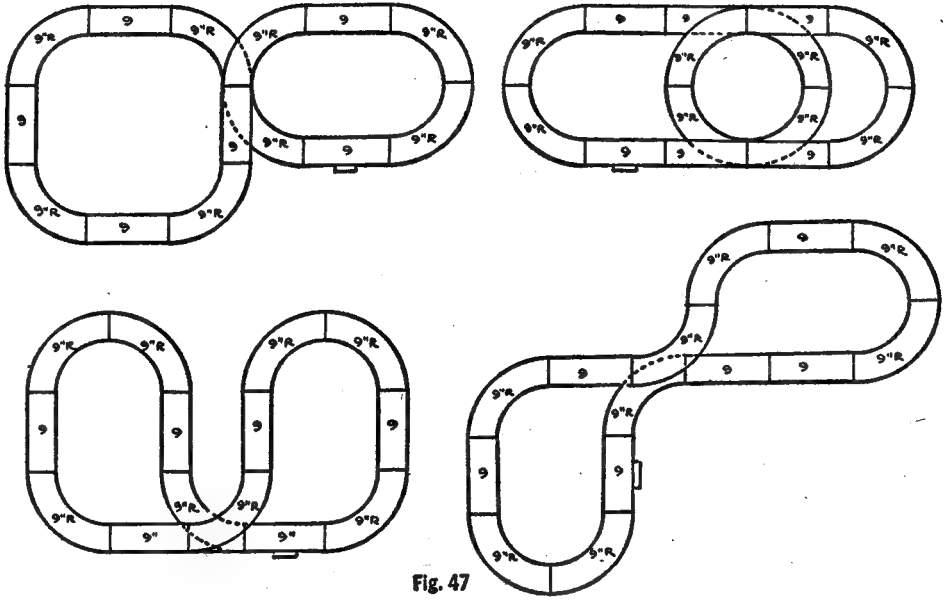
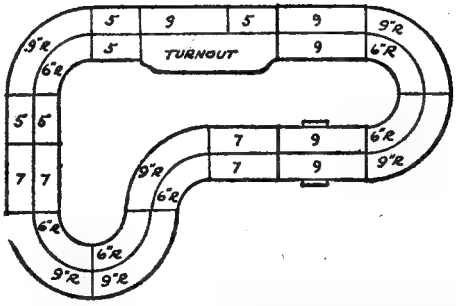
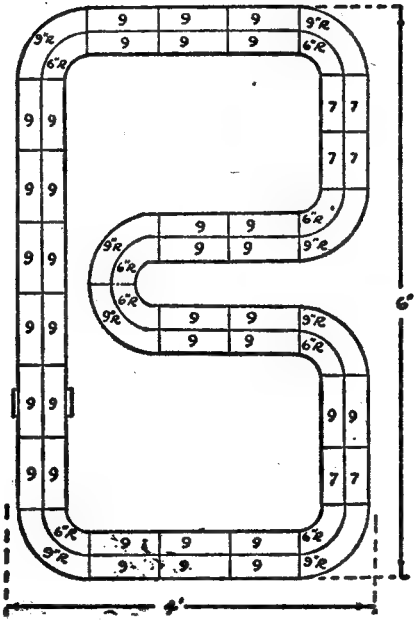


Fig. 47



THE LAYOUTS SHOWN ON THIS PAGE ILLUSTRATE FOUR LANE HIGHWAY OPERATION EMPLOYING 2 TERMINAL SECTIONS AND 4 SPEED CONTROLS.



FLORIDA–GRAND PRIX OF ENDURANCE

Fig. 47

Note how the middle support is notched into 2 x 2-inch frames. Assemble the framing members as shown with 8d (penny) finish nails and glue. Fasten 1 x 4-inch rails to the framing with 6d finish nails and glue. The detail shows how the folding legs are attached with steel hinges and table-leg braces. Sand all surfaces in preparation for the final finishing.

A plywood panel without legs can also be used as the base for the roadway. The panel can be placed on the floor or on a table when needed and propped up against a wall or slipped under a bed when not in use. There is space under a double bed for a 4 x 6-foot layout. Model Motoring vehicles may be kept in a drawer or in the box in which they originally came.

Where a large wall area is available, a roadway layout can be made and hinged so that it folds flat against the wall and is locked in place by hooks. The underside may be used as a decorative space for pictures or for a bulletin board, or a map may be placed on it and shellacked. A bed makes an excellent support for such a roadway layout when it is being used.

The roadway layout is the heart of your Model Motoring system. The arrangement of straightaways, curves, junction-turnoffs, and hills determines what you can do with your vehicles to make their operation a source of never-ending fascination. Figure 47 shows several possible roadway layouts. Included are such famous race courses as Le Mans, Pebble Beach, and the Grand Prix of Endurance. (The latter is a four-lane roadway.) In his instructions, the manufacturer will provide you with many more suggestions for layouts. Choosing a layout is a personal matter, and planning one is part of the fun of Model Motoring.

The roadway sections are held together and electrically connected by "joiner" pins (Figure 48). These pins should fit snugly and the joints should be tight. If the pins are loose, poor electrical contact will be made and there will be a voltage loss in the current which steers your vehicle. To prevent any play in the sections, roadway locks should be inserted between sections.

Roadway sections, when fastened permanently to a table or to roadboard, should be installed with small roundhead screws. Do not use nails; they will often work loose, and cannot be removed without damaging the roadway sections.

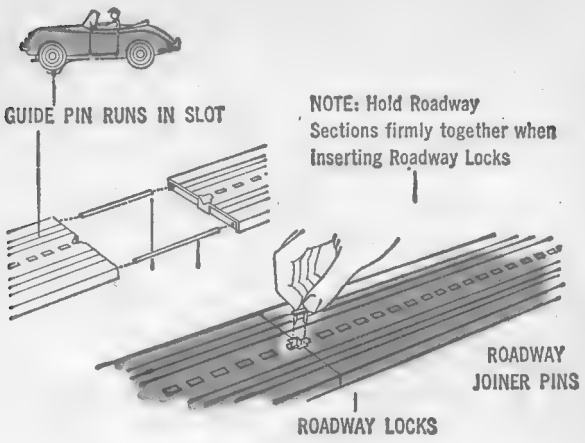

GUIDE PIN RUNS IN SLOT
NOTE: Hold Roadway Sections firmly together when Inserting Roadway Locks
ROADWAY JOINER PINS
ROADWAY LOCKS

Fig. 48

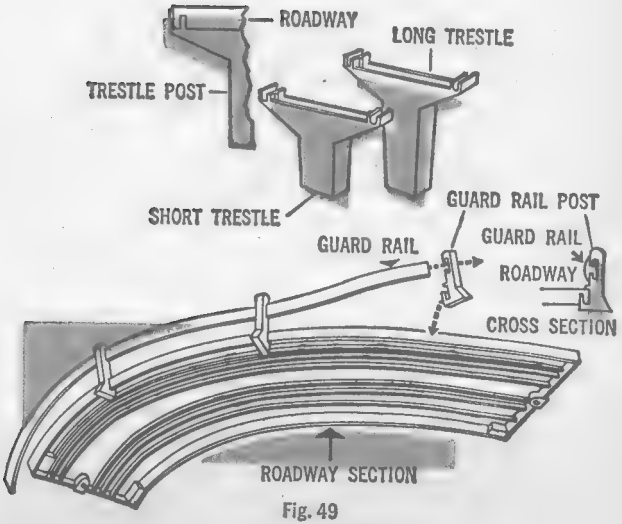

ROADWAY
LONG TRESTLE
TRESTLE POST
SHORT TRESTLE
GUARD RAIL POST
GUARD RAIL
GUARD RAIL
ROADWAY
CROSS SECTION
ROADWAY SECTION

Fig. 49

You can make guide holes for the screws with a finishing nail and hammer or a small bit in an electric drill. Do not tighten the screws too much or they will distort the sections, causing uneven roadways. Before installing the roadway section, it would be wise to paint the tabletop or roadboard—preferably green.

The roadway can be elevated by the use of trestles (Figure 49). For the best operation of your vehicles, remember that all inclines should be gradual: a short trestle post should always precede a long one. To protect cars and trucks on curves, guard rails should be installed as shown. Many Model Motorists suggest building a wood rim around the layout, both to improve its appearance and to keep skidding vehicles from falling to the floor. If you want such a rim, use pieces of 1 x 3-inch boards to edge your tabletop or roadboard.

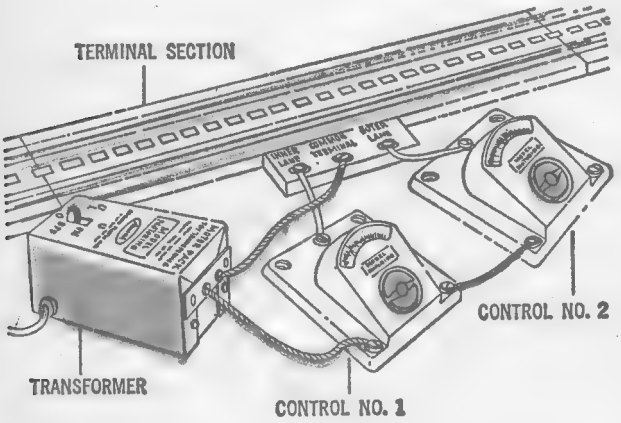


Fig. 50

Figure 50 shows the proper way to wire your roadway for two-lane operation. The length of the wires is determined by the layout you choose and the location of the controls. All wiring can be installed on the underside of the tabletop or

roadboard. Screw holes are provided to fasten the speed controls in place.

When a folding roadboard is used, you can eliminate the necessity of removing two sections of roadway each time the unit is used by laying out the roadway carefully, and using one hinge for each lane which crosses the dividing line. Remove the joiner pins from the roadway joints that come exactly where the folding board separates. Solder a wire to the inside connector (the nickle-silver strip) and to the nearest hinge. Solder another wire to the other half of the hinge and to the matching connector on the other half of the board. The wires and the metal of the hinge will carry the current across the gap. Do the same for each lane, being careful to line them up properly. If you have two lanes crossing the dividing line, you will need four hinges and four sets of connecting wires.

MODEL MOTORING IN OPERATION

Once your roadway is laid out and the wiring is installed, you are ready for the fun of Model Motoring. With the transformer turned off, plug the power cord into a convenient outlet. Then place your vehicles on the roadway making sure their guide pins are set in the slot of the roadway. You can have the vehicles going in the same direction or in opposite directions, since this is an authentic two-lane highway. With the speed controls at zero, turn the transformer switch to "on." Then slowly turn the steering wheels of the speed controls clockwise and your vehicles will start to move. From here on, you are on your own!

The motor in your model automobile is a vibrator type. When the current is on, the coil becomes magnetized and the actuator reed is drawn down, forcing the push rod against the contact arm and breaking the electrical contact. This causes the coil to become de-magnetized. The spring return action of the actuator reed allows contacts to be made again. Each time the contact is made and broken, the actuator reed vibrates up and down and in so doing turns the drive gear (Figure 51). The faster the reed vibrator moves, the faster the auto travels.

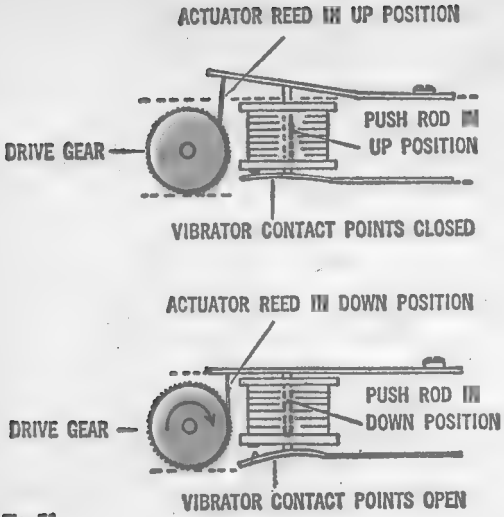
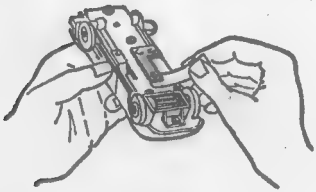

ACTUATOR REED IN UP POSITION
DRIVE GEAR
PUSH ROD IN UP POSITION
VIBRATOR CONTACT POINTS CLOSED
ACTUATOR REED IN DOWN POSITION
DRIVE GEAR
PUSH ROD IN DOWN POSITION
VIBRATOR CONTACT POINTS OPEN

Fig. 51



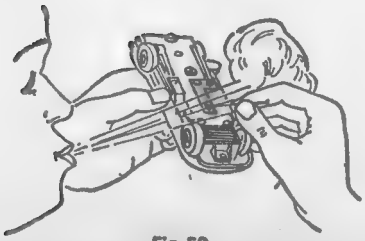


Fig. 52

Remember, your Model Motoring vehicles are not toys, and they should not be given rough handling. They will stand considerable abuse, it is true, but they will last longer and operate better if they are well treated.

Cleanliness is very important to trouble-free operation of your Model Motoring equipment. When it has been idle for a day or two, or even overnight, a light oxide forms on the roadway conductor strips causing poor contact between them and the pick-ups on the vehicles. Therefore, before operating your set, be sure to rub your roadways clean with a lint-free cloth. After wiping the roadway, a vacuum cleaner may be used to pick up dust or lint left around the conductor strips and guide grooves.

Your vehicle will not run if dirt or lint becomes lodged between the contacts. To clean them, insert a strip of paper or a blotter between the contacts and slide it back and forth to remove any foreign matter. Blow out the contacts as illustrated in Figure 52. Contacts can be easily cleaned of foreign matter by lifting the contact arm *slightly* with a pin, toothpick, or small penknife and blowing between the contacts.

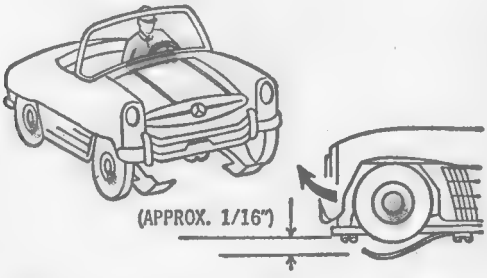


Fig. 53

If the contact brushes are not properly adjusted, poor or intermittent contact with the road conductor strips will result, causing the vehicles to run slowly or with a jerky motion. The brushes can be adjusted as follows:

1. The height of the brushes must be approximately 1/16 of an inch below the tires (Figure 53).
2. The height of both brushes must be the same.

To remove dirt or carbon from between the vibrator and the contact points, it is necessary to unscrew the brush plate assembly and remove the carbon with a Number 4/0 polishing paper or crocus cloth (Figure 54). Do not file and do not use coarse emery cloth. When replacing the brush plate assembly, check the brush height adjustment.

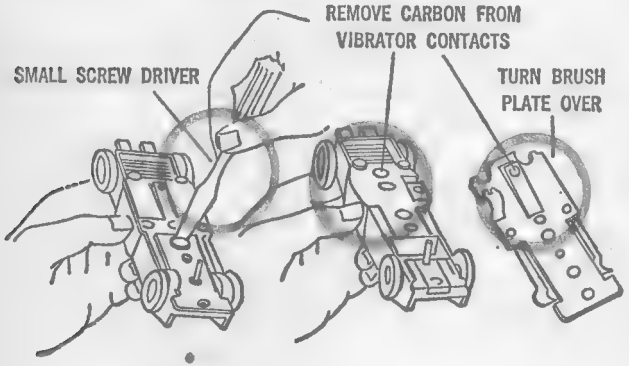


Fig. 54

If the vehicle does not run, runs slowly or with a jerky motion, check the following:

1. Power to the roadway.
2. Brush adjustment—Figure 53.
3. Mutilated brush plate assembly—replacement is required.
4. Mutilated actuator reed assembly—replacement is required.
5. Bumpy or out-of-round tire—replacement is required.
6. Clean roadway.
7. Binding of the wheels against the chassis or body.
8. Make certain that the back end of the right brush makes contact with the coil contact terminal. If necessary,

unscrew the brush plate assembly and bend the back end of the right brush to increase the tension against the coil contact terminal. Check to make sure that it does not short circuit against the chassis.

9

PLASTIC SCALE MODELS THAT FLY

One of the fastest growing enthusiasms among hobbyists is scale models that fly. Playgrounds, fields, backyards, and parks have been transformed into landing strips for airborne models.

Since the Wright brothers' historic flight, hobbyists have been putting replicas of aircraft into the air. Earlier models were usually made of balsa wood, their frames covered with various silks, microfilm, and paper. The early models frequently suffered serious damage when they crashed. But today's models, molded of high-impact, shock-resistant material with critical stress areas formed of heat-resistant molded nylon parts, will survive countless crash-landings. They are built to log many trouble-free years of enjoyment for their earthbound pilots.

Most flying plastic airplanes are factory-assembled and purchased from local hobby dealers ready to fly. Like the solid models, they are authentic reproductions of their prototypes. Their exact scale and faithful detailing make them worthy of display space in your home. However, they are not mere "shelf-warmers" and are most at home in the air.

Because manufacturers strive for perfect realism, most flying models are aerodynamically true; they contain the same in-flight characteristics as their full-size counterparts.

Plastic flying models are available from all stages in the history of flight. There are small, open one-seaters from World War I, sleek multi-engine giants of World War II; famous civilian aircraft; and many, many more. Figure 55 shows the parts of a twin-engine B-25 Mitchell Bomber.

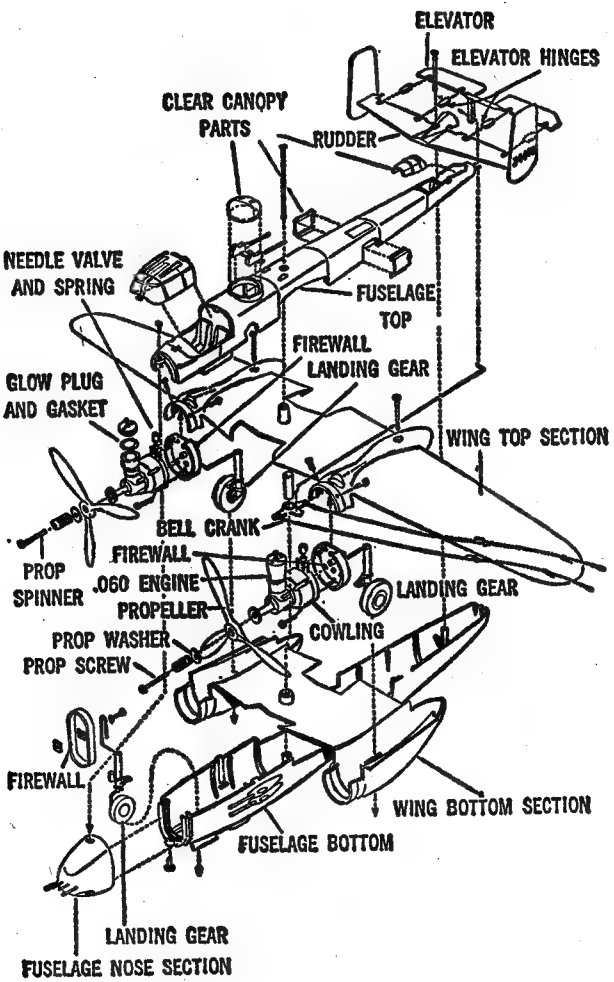

ELEVATOR
ELEVATOR HINGES
CLEAR CANOPY PARTS
RUDDER
NEEDLE VALVE AND SPRING
FUSELAGE TOP
FIREWALL
LANDING GEAR
GLOW PLUG AND GASKET
WING TOP SECTION
BELL CRANK
FIREWALL
PROP SPINNER
.060 ENGINE
PROPELLER
LANDING GEAR
COWLING
PROP WASHER
PROP SCREW
FIREWALL
WING BOTTOM SECTION
FUSELAGE BOTTOM
LANDING GEAR
FUSELAGE NOSE SECTION

Fig. 55

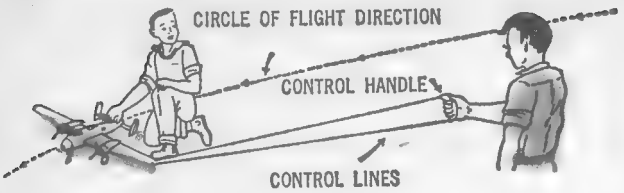


Fig. 56

There are two basic types of model airplane flying: free and control-line flying. In free flying, the model climbs as high as possible under power, then glides to earth when the power is cut off. In control-line flying, the lines act as a flexible extension of the human arm (Figure 56). A flick of the wrist moves the model's elevators up or down and controls the plane's flight. Since most flying models are operated on control lines, the remainder of the chapter will be devoted to this type of flying.

MOTOR STARTING PROCEDURE

Modern one-cylinder gasoline engines have been developed to a high degree of precision and performance. These tiny plants can generate a great deal of power. Some are capable of speeds as high as 100 miles per hour. Because your engine is a precision machine, it is fitted to very close tolerances and must be given the care recommended by the manufacturer.

Today's model engines have become easier to start and deliver more r.p.m.'s than older engines. Engines with glow-plugs are the most popular and are used with the majority of ready-to-fly plastic models. In the past ten years, millions of glow-plug engines have been sold and run with a high degree of success. They are also the simplest to operate: the only accessory needed is a small booster battery for starting.

While there are several varieties of ready-mixed fuels available for glow-plug operation, they generally contain the following basic ingredients: castor oil, a fine lubricant; nitro methane, a very volatile, combustible fluid; and methanol

(alcohol). For best operation you should use the specific type recommended by the manufacturer. (*Never* use gasoline as a fuel for glow-plug engines.) The glow-plugs are initially heated by the booster battery and continue to glow and to ignite the fuel by the heat of combustion.

Some manufacturers claim their engines require no break-in period. However, most experts agree that the following procedure is the safest and surest way of starting a new engine. (The starting procedure will be explained for a typical Class A .060 cubic inch displacement engine. Most glow-plug engines may be started in a similar fashion.)

1. Before fueling, be certain the needle valve is closed by turning it to the right, being careful not to force it. This should be done each time you fill the tank to prevent engine from flooding.

2. Fill the tank through either of the two filler tubes on the top of the fuel tank rear cover. The tank is full when fuel comes out of the second tube. A small fuel pump or squeeze bottle is recommended for fueling and priming purposes.

3. Squirt three or four drops of fuel into the cylinder exhaust parts with the piston in a closed position. This is called priming the engine and is a very important part of the starting procedure. Flip the propeller four or five times.

4. Open the needle valve two-and-a-half to three turns. A marker line is located at the top of the needle valve for your convenience.

5. Attach a 1 1/2-volt battery to the glow-head, using a battery-to-glow-head connector. If you are using regular al-

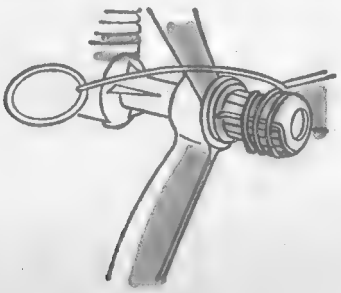


Fig. 57

ligator clips, connect one clip to the center post and the other to any part of the head or cylinder as a ground connection.

6. To start the engine, lay the plain end of the starter cord in one of the grooves in the propeller hub spinner, wrap the cord counterclockwise around the spinner several times, and pull with a fast steady motion (Figure 57). Or flip the propeller with a quick, snappy motion in a counterclockwise direction. The engine may start backward (clockwise rotation). If this happens, stop it by using a cloth and flip the prop again sharply. (It is not possible to control reverse starts. They are not a sign of an engine defect.)

7. If the engine runs out a short, sharp burst and then stops, it does not have enough prime. Repeat the priming procedure. If the engine gives out a weak, muffled sound, it is flooded or overprimed. Continue to flip the propeller sharply until excess fuel is burned out, or blow into the exhaust port with the piston in the *down* position.

Note: Much of the success in starting a two-cycle engine is in knowing whether it has too little or too much prime. Once you have acquired this knowledge, one-flip starts will be quite common.

8. After the engine has started, turn the needle valve slowly to the right until it has reached maximum speed. Immediately disconnect the battery.

9. As the engine warms up, turn the needle valve to the left until the engine begins to run with a slight burbling sound. This is known as a rich needle valve setting and gives the best engine power performance, just as it does for a real aircraft engine. Too lean a setting will result in overheating, causing slower running or total stoppage, particularly when your model is released for flight.

Be careful not to make the valve setting too rich. The engine will run slowly and eventually quit completely. If this happens, hook up the battery again and start flipping the propeller sharply without repriming the engine. As soon as the excess fuel has been discharged, the engine will fire and start running normally.

One of the outstanding features of the glow-plug engine is that it will run with an excess of fuel, and only a slight drop in power. You will find this characteristic al-

lows you a wider margin for error than usual, as far as setting the needle valve is concerned, and will therefore insure your chances of many more successful flights.

Once you have mastered the correct starting procedure, practice a few test runs. When you have become accustomed to your engine, you will enjoy greatly the satisfaction and the thrill of its easy starting and excellent performance.

FLIGHT EQUIPMENT CHECK LIST

The following is a list of tools and equipment you should have with you when you are flying your model:

1. One-and-a-half volt battery or batteries.
2. Battery to glow-head wire leads and connectors.
3. Spare glow-head.
4. Spare propeller.
5. Glow-head and cylinder wrench.
6. Model engine fuel.
7. Fuel pump or squeeze bottle.
8. Flight lines and V-control handle.
9. Screwdriver.
10. Wiping cloths.

All these items may be kept and carried in a small canvas travelling bag.

ENGINE TROUBLE-SHOOTING CHECK LIST

One fact should be kept in mind when dealing with model engines: Most cases of hard starting, or starting failure, are not caused by the engine itself. The fault often lies in your own inexperience or inability to diagnose properly the cause of the trouble. There is very little that can go wrong in a new engine. Therefore, it is foolish to take the engine apart just to satisfy your inquisitive nature. In fact, the factory guarantee is void if you disassemble most engines. The removal of a glow-plug or glow-head or the adjustment of a needle valve is not considered by manufacturers as breaking this guarantee as long as the parts are not damaged or mutilated. To prevent mutilating parts, it is wise to use only the

manufacturer's recommended tools which have been precisely engineered to fit the specific product. Under no circumstances should you use pliers to grip the head or cylinder barrel.

Should you have any difficulty after checking the following list of troubles, it would be wise to return the engine to the factory while it is still under guarantee. Include a legible, detailed letter—print or type if your handwriting is poor—explaining the exact nature of your complaint. Be certain to include your return address. Do not, under any conditions, return the plane itself because this will add considerable expense for special handling and return postage. However, send the entire engine once you have removed it from the plane. When ordering plane parts, send only the part you want replaced.

The following is a list of the more common engine troubles —their symptoms, causes, and remedies:

A. ENGINE WILL NOT FIRE

1. *Glow-head burned out or shorted.*	Replace.
2. *Dead battery.*	Replace.
3. *Engine not primed.*	Prime.
4. *Broken battery leads.*	Replace.
5. *Loose propeller.*	Tighten.
6. *Loose glow-head.*	Tighten.
7. *Loose back plate.*	Tighten.
8. *Stale fuel.*	Purchase new fuel.

B. ENGINE POPS—WILL NOT START. Fuel mixture is set too rich. Close needle valve and continue cranking until the engine's excess fuel runs out. Open the fuel valve two-and-a-half to three turns and crank it over. As a rule it should start immediately with repriming.

C. ENGINE STARTS WITH A SHORT, RUNNING BURST—THEN DIES IMMEDIATELY. Fuel mixture is set too lean. Open needle valve one full turn. Prime engine and crank again.

To determine if the glow-head is operating properly, look into the exhaust port while the piston is in the *down* position. A red reflection (at the top of the piston) of the glowing platinum coil means the head is operating correctly. For easy, positive glow-head checks, you can purchase a glow-plug

tester which is mounted on your battery and is ready for use at all times.

Be sure the engine is cold when removing the glow-head. This will usually prevent the cylinder from backing off. When replacing the glow-head, do not overtighten. Make it just tight enough to prevent compression leaks. Use the wrench furnished by the manufacturer for glow-head removal. It has two usable ends: one for the glow-head, the other for holding the cylinder by gripping the outside of the exhaust parts.

Note: The glow-plug and head are built into one unit. If the plug burns out, replace the entire head, which is priced at the cost of a regular glow-plug. Glow-plugs are never guaranteed. Should one burn out, buy the proper replacement from your hobby dealer. He also stocks other replacement parts necessary for the maintenance of your engine. Always carry a spare glow-head and propeller; never use a nicked or otherwise damaged propeller.

After your last run, make certain that the fuel tank is empty. Either run it out—or drain it by turning the plane upside down to permit the remaining fuel to drain from the filler tubes. Should you remove the tank's back cover for any reason, be certain when you replace it that the fuel pick-up hose is on the right side of the tank (looking toward the rear of the engine). This is important because fuel is thrown to the right side of the tank due to centrifugal force created when flying in a counterclockwise direction. If the hose is positioned on the opposite side, all the fuel will not be used and you will get only a short flight.

You will undoubtedly have a few accidents. If you feel dirt may be in the engine, do not start it again until you have thoroughly cleaned it with denatured alcohol. If you do not have alcohol, use your fuel as the cleaning fluid. For a complete engine cleaning follow this procedure:

1. Remove engine from plane.
2. Brush off exterior of engine with alcohol.
3. Remove glow-head.
4. Thoroughly wash all parts with denatured alcohol, or fuel, by dipping entire engine into the liquid and rotating the crankshaft. Do not use gasoline, petroleum solvents,

thinners, or kerosene, as they will ruin the diaphragm valve.

5. Reassemble the engine by reversing the above procedure, being careful not to cross-thread the glow-head. The gasket should be replaced for best results.

PRE-FLIGHT PROCEDURE

You may want to practice the starting procedure for your engine before going to the flying field. This is generally desirable since the engine should run through several tanks of fuel to break it in.

For control-line flying, you will need a set of lines made of synthetic fiber and a flight control handle. If these did not come with your flying model, they may be purchased from your hobby dealer. He will know the proper type and size for your model.

To rig your plane, unwind a short length of each color line from the reel (one line is usually white while the other may be red or blue), and pass these lines through the slotted holes in the left wing tip. Pass the colored line through the rear hole and attach it to the rear control wire coming from the side of the fuselage. Tie securely with several knots to be sure the line will not loosen. Pass the white line through the front hole and tie it securely to the front wire.

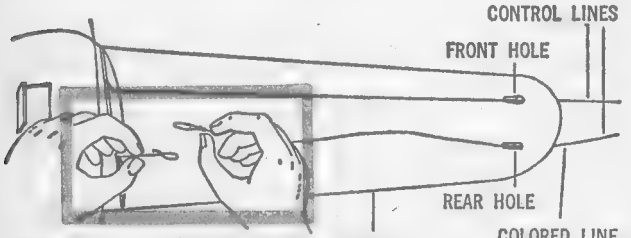


Fig. 58

Unwind the balance of the line from the reel and measure off approximately thirty feet of line. Tie the colored line securely to the handle as shown in Figure 58. Pass the white line through the hole, as shown in the illustration, and before

tying adjust the length so that the elevator on the airplane is level when the control handle is in an *up-and-down* position. The line should be tied securely without moving the adjustment out of position. Be sure that when the top of the handle is raised toward you, the elevator goes to the *up* position. This set-up makes the colored line the *up* line, and the white line the *down* line.

Models can be flown in either direction, but most flying is in a counterclockwise circle. The amount of flying space required depends on the length of your lines. Short grass, smooth dirt, or pavement make the best flying sites.

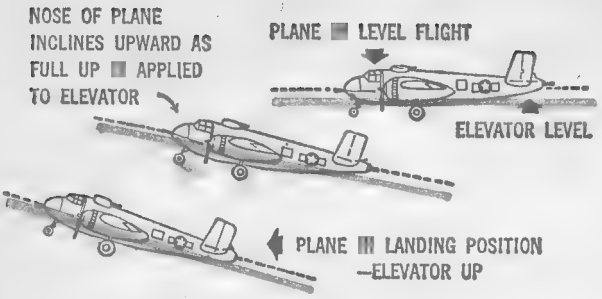
Mark off the center of your flight circle with a piece of cloth or paper held down with a small weight. This reference point will help you to stay close to the center while flying. Make certain there are no obstructions within your flying circle. If in doubt, have your mechanic-helper walk the airplane around the complete circle while you stand in the center holding the control handle.

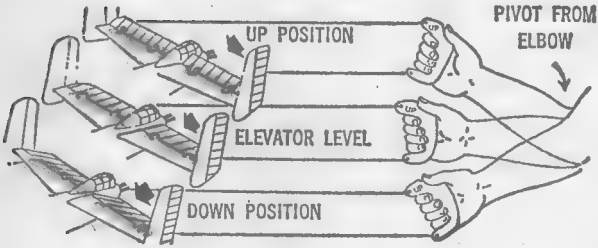
Set the airplane in a nose-downwind position at the edge of the flying circle. Walk the control lines out from the airplane being sure to keep the lines separated; do not allow them to tangle or cross each other. Check the *up-and-down* position again and lay the control handle near the center marker.

FLYING YOUR SCALE MODEL

To fly your scale model, start the engine as previously described. (In twin engine models, either engine may be started first; however, it is preferable to have the engine closest to the center of the flying circle started last.) After the engines are running and the needle valve setting is satisfactory, have your mechanic-helper hold the airplane securely in a slight angle away from the circle of flight direction. (This will tend to keep control lines taut on release of the airplane and prevent the airplane from turning in on take-off.)

Go to the center of the circle and pick up the control handle, making sure the colored line is in the correct position on top. Again check the *up-and-down* movement of the


NOSE OF PLANE
INCLINES UPWARD AS
FULL UP ■ APPLIED
TO ELEVATOR
PLANE ■ LEVEL FLIGHT
ELEVATOR LEVEL
PLANE ■ LANDING POSITION
—ELEVATOR UP


PIVOT FROM
ELBOW
UP POSITION
ELEVATOR LEVEL
DOWN POSITION

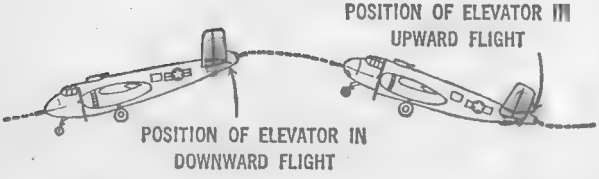

POSITION OF ELEVATOR ■
UPWARD FLIGHT
POSITION OF ELEVATOR IN
DOWNWARD FLIGHT

Fig. 60

control; this is most important before the aircraft is released. If there is any doubt regarding correct control setting, lay the control handle down, stop the engines, and make the necessary adjustments to control lines.

When you are sure of the controls, signal your mechanic-helper to release the airplane. Under no circumstances should he push or shove the airplane. As he releases the plane, you should have the control handle in a level position.

The airplane will roll smoothly forward, under its own power, and become airborne in a short distance. As the airplane takes off, it will assume a climbing attitude. Do not let it climb higher than six or eight feet until you have mastered the controls satisfactorily. To keep it from climbing too high, give a smooth downward motion of the control handle using your entire arm as a pivot—not just the wrist. As the airplane levels off, return the control position to neutral, again using your arm. If more altitude is required, raise your arm. This will raise the elevator and cause the airplane to climb. *Remember at all times to use smooth arm action.* (Using short abrupt control changes will cause excessive amounts of overcontrol and will result in a roller-coaster flight pattern with an eventual nose dive into the ground.) The action of the elevator is the same as on big aircraft: when the elevator is raised, the aircraft noses up; when the elevator is lowered, the craft noses down (Figure 59).

When flying in a breeze you will find that a slight amount of down-control when flying around into the wind, and a slight amount of up-control when flying around the downwind side of the circle, will help keep a level flight pattern.

Continue flying in this level attitude until the fuel supply is consumed. (An indication of this is a sudden leaning out of the engine and increased r.p.m.'s.) As the engine stops running, start the airplane in a normal glide by giving a slight amount of down-control and then return to neutral position. Hold this position until about two feet from the ground, and then smoothly apply full up-control. The airplane should flare out and make a perfect three-point stall landing. Continue full up until roll out is completed. (Make certain at all times during the flight and landing that the lines from the

control handle to the airplane are taut. It may be necessary to back away from the center of the circle in order to keep the lines taut. If so, move in a circular path around your center marker.)

After the roll-out is completed, remain in the center of the circle and have your mechanic-helper carry the airplane back to the starting point on the circle for servicing. You may then lay the control handle down at the center marker and proceed to clean and service the airplane. Wipe all oil and accumulated dust or dirt particles from the aircraft, and with the piston of the engine in a closed position, squirt some fresh fuel over the exposed parts of the engine to wash it down. If ready to fly again, refuel and make your pre-flight line check immediately. Otherwise, cover your engine and cowling with a clean piece of cloth to prevent dust and dirt from blowing into the engine. Remove your control lines and handle from the center of the flight circle.

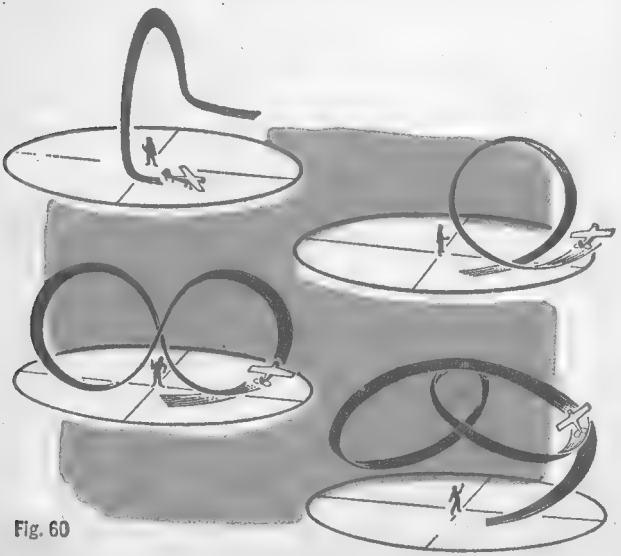


Fig. 60

As you fly your model more and more, you will wish to try some acrobatic stunts (Figure 60). Before undertaking stunt flying, you must be sure that you have mastered straight-level flying, as well as straight dives and climbs. The first trick you should try is the simple wing-over. At the peak of the flight, the plane is "standing" on its wing. Once this is accomplished, it is easy to make the loop.

When you make your first loops, allow yourself the full length of the control lines. The loop should be started with your airplane level at an altitude of approximately six feet. On the downwind side of the circle, gradually nose your craft up. Do not apply full up too suddenly or the plane may "mush" and lose its flying speed. Instead, apply the up movement gradually so that it starts climbing in a wide sweep. More up-control, or full up-control, can then be applied quickly so that the airplane will go over on its back and start down. Then slowly return the controls to neutral, leveling off your aircraft as it comes down toward the ground. While your first few loops may be tall ovals rather than true circles, you will be able to smooth out the stunt with practice. Once you have mastered the simple loop, you may wish to try overhead eights, horizontal eights, and inverted flying. In all stunt flying, be sure to keep your lines free of any kinks.

It may be necessary for the beginner to become accustomed to turning in a circular pattern. The best results will be obtained if the prospective flyer practices turning before he attempts to fly his airplane. As the fuel supply in your engine lasts from three to five minutes under normal conditions, it is necessary to be able to turn thirty or forty times without becoming dizzy. The flyer should start slowly in practice—about 10 turns. In several days he will reach the point where turning forty times or more has little or no effect on his equilibrium. Once accustomed to turning in this manner, you may not fly for some time and go back to it with no further pre-flight turning practice required.

During the flying of your plastic model, there is a slight chance of damage to your plane. Minor damages to the airframe may be repaired by cleaning with soap and water, drying, and cementing the break with polystyrene cement,

then patching with a thin piece of cloth material. (Pieces of old linen handkerchiefs are excellent for patching.) Allow cement to harden fully overnight.

Save the control line reel and use it to store line between flying trips. If you make a small loop when tying lines to the lead-out wires, the lines may be slipped off and on easily to facilitate storage on the reel.

FLYING IN COMPETITION

As your skills in model airplane flying increase, you may wish to enter local competition and eventually nationwide events such as those sanctioned by the Academy of Model Aeronautics. You may also wish to take part in team racing —a model airplane sport rapidly gaining popularity across the country. In a typical event, as many as six models take part and the race may vary from 10 to 150 laps. All engines are started at the same time and are released by a crew member as the starting flag drops. Once airborne, there is plenty of overtaking and passing as the laps go by. Refueling stops are necessary in the longer races and excitement runs high as the pit crews hurry to refuel in the shortest time. The winner, of course, is the plane that completes the required number of laps first and lands successfully. Rules governing this type of event are quite specific: Models must resemble real racing airplanes; they must have full fuselages, completely cowled except for plug access; a cockpit with a dummy pilot's head, etc. A typical racer for such competitions may be found in Photograph G.

The Academy of Model Aeronautics is the rules and governing organization of model flying competitions. The Academy issues the rules rather than makes them. Whenever modelers wish to change the rules, nationwide voting must approve such changes. Since the same rules are used throughout the country, any record flights are assured of recognition. The Academy compiles the records achieved and announces them to all modelers through the various model publications.

Membership in the Academy, a must for the serious contest flyer, gives him a voice in the rule-making and election

of governing officers. A model flyer's license is issued to each modeler and is required for entry in all Academy-sanctioned contests. A complete book of official rules and regulations is also furnished, as is liability insurance covering damage to property or persons during competition in approved contests. Cost of yearly membership in the Academy depends upon age: 21 years and over, $2; 20 to 16 years, $1.50; and $1 for those under 16 years. For additional information, address the Academy of Model Aeronautics, 1025 Connecticut Avenue, N. W., Washington 6, D. C.

HERE AT LAST...

a complete, authoritative guide to plastic hobby kits, written both for beginners and for seasoned model builders.

THE COMPLETE BOOK OF PLASTIC MODEL KITS is the only book of its kind...chock full of tested, proven advice and creative, imaginative suggestions...covers the field from "solid" display models to action-packed motorized planes and automobiles.

HERE ARE ONLY A FEW OF THE SUBJECTS COVERED:

- Research and development
- Tools and equipment
- Understanding instruction sheets
- Techniques of assembly
- Decorating plastic models
- Sailing ship rigging
- Uses for finished models
- Tabletop photography
- Model railroad layouts
- Model motoring in HO scale
- Flying model airplanes

Cover printed in U.S.A.